

OSCILLATOR STRENGTHS AND DAMPING CONSTANTS FOR ATOMIC LINES IN THE J AND H BANDS

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ABSTRACT

We have built a line list in the near-infrared J and H bands (1.00-1.34, 1.49-1.80 μm) by gathering a series of laboratory and computed line lists. Oscillator strengths and damping constants were computed or obtained by fitting the solar spectrum.

The line list presented in this paper is, to our knowledge, the most complete one now available, and supersedes previous lists.

1. Introduction

Spectroscopy in the near-infrared (NIR) is at present essentially limited to molecular bands, partly due to a lack of a line list with reliable atomic constants.

Lists of lines in the NIR are given for individual elements and in most cases only the identification (element/wavelength) is provided.

With the advent of improved infrared detectors, it is possible to carry out abundance studies using these wavelength regions. High excitation potentials typical of the lines in these wavelength regions, make such stellar NIR spectroscopy suitable as a complement to the optical region, by using particular lines such as S I, Mn I (lines with lower excitation potential) in giants, or applicable to hot dwarf turn-off stars.

The NIR is otherwise the only means to obtain spectra for objects located in reddened regions such as the Galactic bulge, for which the optical regions are not reachable due to a high extinction (e.g. Ramirez et al. 1998; Sellgren et al. 1998).

The line list is presented in Sec. 2 and the derivation of the damping constants and oscillator strengths are described in Sec. 3 and Sec. 4, respectively. Concluding remarks are given in Sec. 5.

2. Line list

The atomic line data was started with the lists by Ramsauer et al. (1995) and Swensson et al. (1973), and progressively available line lists were added. Most additional lines correspond to Fe and Si, but lines of the elements C, Mg, Ca, Ti, Cr, Mn, Ni were also included. The literature

used for each element is given in Table 1. Besides line lists for individual elements, we used the general line lists of Swensson et al. (1973), Biémont & Grevesse (1973), Biémont (1976), Outred (1978), Solanki et al (1990), Livingston & Wallace (1991), Wallace et al. (1993), Kurucz (1995), Ramsauer et al. (1995), Hirata & Horaguchi (1995).

We made some new identifications of solar line features surveying the most recent laboratory and theoretical work and using the telluric free Kitt Peak Solar Atlas (Livingston & Wallace 1991, Wallace et al. 1993). A new identification is based on the intensities and on the correspondence between the observed solar (λ_{\odot}) and laboratory (λ_{lab}) wavelengths (or theoretical wavelength, λ_{th} , in some cases).

We note that in the Wallace et al. (1993) solar atlas, all lines of Al I are assigned to Al II, probably due to a misprint.

Ni I lines show isotopic splitting, and for cases in which they are not severely blended with other lines, we included the isotopic components in the list. Isotopic splitting of Ni is remarkable in the NIR, and was reported by Brault & Holweger (1981), Biémont et al. (1986) and Litzén et al. (1993). The isotopic species ($^{58,60,62,64}\text{Ni}$) are indicated in column 6 of Tables 2 and 3.

Molecular lines of CN $A^2\Pi - X^2\Sigma$ and vibration-rotation CO $X^1\Sigma^+$ bands were included in the synthetic spectra calculations. The line lists for CN were made available by S. P. Davis (see <http://sumner.berkeley.edu>) and the CO line lists were adopted from Goorvitch (1994).

For CN and CO the Honl-London factors were computed using formulae by Kovács (1969). Rotational Franck-Condon factors for CN were computed following Dwivedi et al. (1978). For CO the expectation values of the effective dipole moment operator were taken from Goorvitch (1994). The electronic transition moment of CN bands were obtained from a fit to CN unblended solar lines. The dissociation potentials adopted are $D_0(\text{CN}) = 7.65$ eV (Bauschlicher et al. 1988) and $D_0(\text{CO}) = 11.09$ eV (Huber & Herzberg 1979).

3. Damping constants

The van der Waals collision broadening is given by $\gamma_6/N_H = 17 v^{3/5} C_6^{2/5}$ where v is velocity, N_H is the number density of hydrogen and C_6 is the interaction constant for van der Waals pressure broadening.

C_6 was computed by using the cross sections $\sigma(v)$ given by Anstee & O'Mara (1995) for atomic transitions s-p, p-s, Barklem & O'Mara (1997) for transitions p-d, d-p and Barklem, O'Mara & Ross (1998) applicable to transitions involving excited states d-f, f-d.

These tables give $\sigma(v)$ in terms of the principal effective quantum numbers (n^*) of the upper and lower states, $n^* = 1 / \sqrt{(\chi_{ion}(E) - \chi_{exc}(E))/\chi_{ion}(H)}$, where $\chi_{ion}(H)$ and $\chi_{ion}(E)$ are the ionization energies of hydrogen and the element E respectively, and $\chi_{exc}(E)$ is the excitation

potential.

Because the tables of cross sections do not cover very high excitation lines (high n^* numbers) we had to make extrapolations (until $\Delta n^* \approx 0.4$). In those cases the extrapolation is indicated by a letter “E” next to the C_6 values given in Tables 2 and 3.

In cases where it was not possible to use the tables of cross section, we computed the C_6 values by employing the classical formula: $C_6 = 6.46 \times 10^{-34} \bar{\Delta r}^2$, using the Coulomb approximation to calculate the mean square radius \bar{r}^2 of the upper and lower states. We used an enhancement factor E of 2.5, which means a C_6 value 10 times larger than the classical van der Waals value ($C_6 \propto \gamma_6^{2.5}$). The lines for which this method was used are indicated with a letter “M” next to the C_6 values.

Finally, in some cases we obtained the C_6 values from a fit to the solar spectrum. In those cases a letter “A” is given next to the C_6 values.

4. Astrophysical oscillator strengths

The oscillator strengths are derived from an iterative fit of synthetic spectra to the solar spectrum (Livingston & Wallace 1991, Wallace et al. 1993). The code for spectrum synthesis is described in Barbuy (1981, 1982). The synthetic spectra are calculated with the LTE approximation. The adopted solar abundances are those reported by Grevesse et al. (1996).

Some strong lines with large central depths show NLTE effects and the gf values are probably overestimated. We tried to avoid it by fitting the wings.

The errors in the oscillator strengths are indicated with a superscript to the gf value in Tables 2 and 3, by a : ≤ 0.05 dex, b : ≤ 0.10 dex, c : ≤ 0.15 dex, d : > 0.15 dex. The quoted errors are estimated basically by uncertainties in fixing the continuum, blends, NLTE, or solar line profiles showing residuals of blends with heavy telluric absorption. The letter f is used to indicate that the gf value of the line was fixed while the oscillator strengths of the neighbouring lines were fitted; in these cases, the source of the gf fixed value is in most cases Kurucz (1995).

5. Conclusions

We present a complete line list of atomic lines, typical of late A-F-G-K stars, in the J and H bands. The only such work available in the literature is the one by Stalin et al. (1997), which comprises however only about 15 % of the lines contained in our list.

A major contribution provided in the present paper is the computation of accurate damping constants C_6 line-by-line, and subsequent derivation of gf values, obtained by fitting the solar spectrum, resulting in accurate oscillator strengths.

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Table 1. Summary of Atomic Lines

Z	Element	Abundance	n° lines J/H	wavelength range (Å)	ref.
1	H I	12.00	3/5	10049 - 12818, 15261 - 17362	[1]
2	He I	10.99	3/0	10829 - 10830	[2]
6	C I	8.55	58/83	10124 - 12897, 15050 - 17966	[3,4,5,6]
7	N I	7.97	11/0	10105 - 10758	[7]
8	O I	8.87	5/0	11297 - 13165	[8,9,10,11]
11	Na I	6.33	16/2	10182 - 12679, 16374 - 16389	[12,13]
12	Mg I	7.58	28/51	10299 - 12433, 15025 - 17762	[14,15,16]
12	Mg II	7.58	6/0	10092 - 10952	[16,17]
13	Al I	6.47	7/5	10768 - 13151, 16719 - 17708	[18,19]
14	Si I	7.55	131/50	10001 - 13326, 15244 - 17623	[20,21,22]
15	P I	5.45	10/4	10084 - 11183, 15711 - 17112	[23,24]
16	S I	7.21	14/16	10455 - 11602, 15400 - 16597	[25,26]
19	K I	5.12	8/3	11020 - 12522, 15163 - 15618	[12,13]
20	Ca I	6.36	45/7	10249 - 13318, 15067 - 16197	[27]
20	Ca II	6.36	5/2	11429 - 11950, 16561 - 16650	[27,28]
21	Sc I	3.17	0/1	17523	[29]
22	Ti I	5.02	56/26	10003 - 13077, 15016 - 17447	[30]
22	Ti II	5.02	1/0	10691	[31]
23	V I	4.00	5/0	10230 - 11195	[32]
24	Cr I	5.67	40/14	10080 - 13217, 15069 - 17938	[33,34]
25	Mn I	5.39	73/62	12899 - 13319, 15159 - 17746	[35,36,37]
26	Fe I	7.50	363/800	10007 - 13392, 14904 - 17986	[38...46]
26	Fe II	7.50	13/0	10173 - 12264	[43,47,48,49,50]
27	Co I	4.92	12/5	10019 - 12880, 16130 - 16997	[51,52]
28	Ni I	6.25	51/109	10049 - 13264, 15032 - 17988	[53,54]
30	Zn I	4.60	3/0	11054 - 13197	[55]
32	Ge I	3.41	7/0	10039 - 11715	[56]
38	Sr II	2.90	3 /0	10037 - 10915	[56]
39	Y II	2.24	5/0	10105 - 10605	[57]
57	La II	1.22	1/0	11874	[56]
63	Eu II	0.51	1/0	10020	[56]

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TABLE 2
LINE LIST IN THE J BAND

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Si I	10001.29	6.08	-2.91 ^a	0.30E-29	
Ti I	10003.09	2.16	-1.32 ^a	0.38E-31	
Fe I	10006.86	5.51	-1.97 ^a	0.12E-29	
Si I	10010.07	6.26	-3.04 ^b	0.63E-29 ^M	
Ti I	10011.74	2.15	-1.54 ^a	0.38E-31	
Si I	10013.86	6.40	-1.73 ^a	0.11E-28 ^M	
Co I	10019.31	5.11	-0.70 ^c	0.39E-30	
Eu II	10019.55	2.09	-0.30 ^d	0.30E-31 ^A	
Fe I	10019.79	5.48	-1.44 ^a	0.10E-29	
Fe I	10022.28	5.51	-1.71 ^a	0.11E-29	
Si I	10025.74	6.08	-1.75 ^a	0.30E-29	
Fe I	10026.08	4.59	-2.55 ^b	0.29E-30	
Fe I	10032.86	5.51	-1.36 ^b	0.11E-29	
Ti I	10034.49	1.46	-2.09 ^b	0.25E-31	
Sr II	10036.65	1.80	-1.10 ^b	0.20E-31 ^A	
Ge I	10039.42	4.85	0.40 ^b	0.42E-30	
Fe I	10041.47	5.01	-1.84 ^b	0.25E-30	
Co I	10046.40	2.72	-2.25 ^b	0.25E-31	
Fe I	10048.58	5.48	-2.40 ^c	0.99E-30	
Ni I	10048.60	4.24	-2.35 ^c	0.49E-30	
Ti I	10048.83	1.44	-2.45 ^b	0.25E-31	
Fe I	10057.65	5.03	-1.76 ^b	0.26E-30	
Ti I	10057.73	2.17	-0.90 ^f	0.39E-31	
Fe I	10058.25	2.20	-5.34 ^b	0.27E-31	
Ti I	10059.90	1.43	-2.40 ^b	0.24E-31	
Ni I	10061.25	5.49	-0.80 ^b	0.19E-29 ^E	
Fe I	10065.05	4.84	-0.57 ^b	0.95E-30	
Ti I	10066.55	2.16	-1.85 ^b	0.39E-31	
Si I	10068.37	6.10	-1.40 ^b	0.30E-29	
Fe I	10070.52	5.51	-1.54 ^b	0.11E-29	
Ni I	10075.64	5.49	-1.12 ^b	0.19E-29 ^E	
Fe I	10077.19	2.99	-4.28 ^a	0.47E-31	
Co I	10078.58	2.70	-2.80 ^c	0.24E-31	
Cr I	10080.30	3.56	-1.45 ^a	0.32E-30	
Fe I	10080.36	5.10	-2.89 ^a	0.34E-30	
Fe I	10081.39	2.42	-4.53 ^a	0.31E-31	
P I	10084.28	7.21	-0.07 ^a	0.29E-30	
Fe I	10084.43	4.58	-2.90 ^a	0.28E-30	
Fe I	10085.07	4.58	-2.54 ^a	0.28E-30	
Fe I	10086.26	2.95	-4.10 ^a	0.46E-31	
Fe I	10089.77	5.45	-1.77 ^a	0.87E-30	
Cr I	10089.77	4.39	-0.97 ^f	0.55E-30 ^E	
Mg II	10092.09	11.63	0.96 ^a	0.50E-29 ^A	
Mg II	10092.16	11.63	1.07 ^a	0.50E-29 ^A	
Mg II	10092.16	11.63	-0.48 ^a	0.50E-29 ^A	
Si I	10098.55	6.40	-1.76 ^a	0.86E-29 ^M	
Fe I	10104.20	5.39	-2.27 ^b	0.73E-30	
N I	10105.13	11.75	0.35 ^b	0.32E-30	
Y II	10105.52	1.72	-1.89 ^b	0.30E-31 ^A	
Fe I	10105.52	5.39	-2.71 ^f	0.72E-30	
Cr I	10111.98	3.01	-2.46 ^d	0.15E-30	
N I	10112.53	11.76	0.59 ^c	0.33E-30	
Fe I	10114.02	2.76	-3.76 ^a	0.39E-31	
N I	10114.64	11.76	0.81 ^b	0.33E-30	
Fe I	10119.58	3.37	-4.13 ^a	0.13E-30	
Ti I	10120.93	2.17	-1.84 ^a	0.39E-31	
C I	10123.87	8.54	-0.09 ^a	0.39E-30	
Si I	10124.94	6.12	-2.15 ^a	0.41E-29 ^M	
Co I	10128.06	4.57	-0.64 ^d	0.61E-30	
Si I	10131.10	6.10	-3.51 ^d	0.30E-29	
Fe I	10132.66	5.92	-1.59 ^a	0.36E-29	
Fe I	10137.10	5.09	-1.83 ^a	0.31E-30	
Fe I	10142.82	5.06	-1.64 ^a	0.29E-30	
Ni I	10145.30	4.27	-2.04 ^a	0.52E-30	⁶⁰ Ni
Ni I	10145.35	4.27	-1.62 ^a	0.52E-30	⁵⁸ Ni
Fe I	10145.57	4.80	-0.41 ^a	0.84E-30	
Fe I	10149.08	5.10	-2.23 ^a	0.33E-30	
Fe I	10153.30	5.45	-1.39 ^b	0.85E-30	
Fe I	10153.30	5.51	-2.87 ^f	0.10E-29	
Fe I	10155.16	2.18	-4.36 ^a	0.26E-31	
Si I	10156.14	6.10	-1.78 ^a	0.30E-29	
Fe I	10156.51	4.59	-2.28 ^a	0.28E-30	
Fe I	10167.47	2.20	-4.26 ^a	0.27E-31	
Co I	10167.47	4.47	-0.59 ^f	0.49E-30	
Ti I	10170.47	1.44	-3.10 ^c	0.24E-31	
Fe I	10173.40	3.69	-5.60 ^b	0.89E-31	
Fe II	10173.49	5.51	-2.79 ^b	0.30E-30 ^A	
Fe I	10175.50	5.45	-2.11 ^a	0.84E-30	
Na I	10182.86	3.75	-2.05 ^c	0.30E-29	
Y II	10186.44	1.84	-1.97 ^b	0.30E-31 ^A	
Fe II	10189.02	6.73	-2.09 ^b	0.30E-30 ^A	
Ti I	10189.13	1.46	-3.27 ^f	0.24E-31	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Ni I	10193.23	4.09	-0.81 ^a	0.38E-30	
Fe I	10195.11	2.73	-3.63 ^a	0.38E-31	
Cr I	10197.01	2.99	-2.44 ^a	0.14E-30	
P I	10204.70	7.21	-0.59 ^a	0.28E-30	
Fe I	10216.32	4.73	-0.29 ^a	0.74E-30	
Cr I	10217.12	4.40	-1.53 ^c	0.55E-30 ^E	
Fe I	10218.41	3.07	-2.93 ^a	0.50E-31	
Fe I	10218.98	5.48	-1.98 ^a	0.90E-30	
Ni I	10226.11	5.51	-0.90 ^a	0.31E-29 ^M	
Si I	10229.27	6.08	-2.67 ^a	0.30E-29	
Fe I	10230.78	5.87	-0.70 ^a	0.25E-29	
V I	10230.78	4.74	-1.75 ^f	0.38E-29 ^M	
Y II	10245.22	1.74	-1.91 ^b	0.30E-31 ^A	
Fe II	10245.58	6.73	-1.98 ^a	0.30E-30 ^A	
Ca I	10249.15	4.53	-0.96 ^a	0.19E-28 ^M	
Fe I	10252.55	5.83	-1.08 ^a	0.19E-29	
Ca I	10254.77	4.53	-0.98 ^a	0.19E-28 ^M	
Ca I	10256.55	4.53	-1.41 ^a	0.19E-28 ^M	
Fe I	10258.60	4.58	-2.97 ^a	0.21E-30 ^E	
Fe I	10262.46	5.48	-1.54 ^a	0.89E-30	
Si I	10263.19	6.08	-2.54 ^a	0.30E-29	
Fe I	10265.22	2.22	-4.67 ^a	0.27E-31	
Ca I	10273.69	4.53	-0.76 ^a	0.19E-28	
C I	10274.99	9.33	-1.64 ^a	0.30E-31 ^A	
Ca I	10276.23	4.53	-1.53 ^a	0.19E-28 ^M	
Si I	10276.85	6.22	-2.66 ^a	0.31E-29 ^E	
Fe I	10283.77	5.51	-1.57 ^a	0.98E-30	
Cr I	10283.77	5.91	-3.38 ^f	0.30E-31 ^A	
Ca I	10288.58	4.62	-1.46 ^c	0.93E-29 ^A	
Si I	10288.94	4.92	-1.71 ^a	0.30E-30	
Ni I	10295.01	5.51	-0.86 ^a	0.31E-29 ^M	
Mg I	10299.24	6.12	-2.06 ^a	0.22E-28 ^A	
Si I	10301.41	6.10	-1.83 ^a	0.30E-29	
Ni I	10302.57	4.27	-1.62 ^a	0.50E-30	60Ni
Ni I	10302.62	4.27	-1.20 ^a	0.50E-30	58Ni
Fe I	10307.45	4.59	-2.45 ^a	0.28E-30	
C I	10310.20	9.33	-1.68 ^a	0.30E-31 ^A	
Mg I	10312.52	6.12	-1.71 ^a	0.25E-28 ^M	
Si I	10313.20	6.40	-1.56 ^a	0.77E-29 ^M	
Ni I	10321.06	5.53	-0.66 ^a	0.31E-29 ^M	
Sr II	10327.34	1.84	-0.40 ^a	0.50E-31 ^A	
Fe I	10327.34	5.54	-3.45 ^f	0.83E-30 ^E	
Y II	10329.74	1.75	-1.71 ^a	0.30E-31 ^A	
Ni I	10330.24	4.11	-1.27 ^a	0.38E-30	58Ni
Ni I	10330.30	4.11	-1.69 ^a	0.38E-30	60Ni
Fe I	10332.33	3.63	-3.15 ^a	0.83E-31	
Fe I	10333.18	4.59	-2.30 ^a	0.27E-30	
Fe I	10336.37	6.07	-1.14 ^a	0.69E-29 ^M	
Fe I	10340.89	2.20	-3.65 ^a	0.26E-31	
Ca I	10343.83	2.93	-0.40 ^a	0.68E-30	
Fe I	10345.20	6.16	-0.91 ^a	0.10E-29 ^A	
Fe I	10347.96	5.39	-0.82 ^a	0.68E-30	
Si I	10352.56	6.12	-2.56 ^a	0.30E-29	
Fe I	10353.81	5.39	-1.09 ^a	0.67E-30	
Fe I	10353.83	5.51	-2.31 ^f	0.95E-30	
Co I	10354.46	4.40	-0.90 ^b	0.42E-30	
Fe I	10360.58	5.52	-2.04 ^a	0.10E-29	
Fe I	10362.70	5.48	-1.34 ^a	0.86E-30	
Fe I	10364.06	5.45	-1.19 ^a	0.78E-30	
Fe I	10365.17	5.59	-2.34 ^b	0.86E-30 ^E	
Fe II	10366.17	6.72	-1.76 ^a	0.30E-30 ^A	
Si I	10371.27	4.93	-0.80 ^a	0.30E-30	
Fe I	10371.69	3.64	-3.81 ^a	0.83E-31	
Ni I	10378.50	4.09	-2.30 ^a	0.36E-30	62Ni
Ni I	10378.56	4.09	-1.42 ^a	0.36E-30	60Ni
Ni I	10378.62	4.09	-1.00 ^a	0.36E-30	58Ni
Fe I	10379.01	2.22	-4.25 ^a	0.27E-31	
Co I	10382.30	2.87	-2.99 ^b	0.28E-31	
Ge I	10382.42	4.96	0.47 ^a	0.48E-30	
Fe I	10387.48	5.54	-1.90 ^a	0.83E-30 ^E	
Fe I	10388.74	5.45	-1.57 ^a	0.77E-30	
C I	10391.36	9.70	-1.00 ^a	0.30E-30 ^A	
Cr I	10391.96	3.01	-2.95 ^b	0.14E-30	
Fe I	10395.80	2.18	-3.42 ^a	0.26E-31	
Ti I	10396.81	0.85	-1.79 ^a	0.21E-31	
Si I	10399.81	6.10	-2.77 ^a	0.30E-29	
Fe I	10400.79	5.54	-1.73 ^a	0.83E-30 ^E	
Fe I	10401.72	3.02	-4.36 ^a	0.47E-31	
Fe I	10403.20	5.52	-2.15 ^a	0.99E-30	
Ge I	10404.91	4.85	0.44 ^b	0.39E-30	
Si I	10406.96	6.62	-0.77 ^a	0.20E-28 ^M	
Si I	10414.85	6.62	-1.38 ^a	0.20E-28 ^M	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Cr I	10416.65	3.01	-2.40 ^a	0.14E-30	
Si I	10422.28	6.62	-2.42 ^a	0.20E-28 ^M	
Fe I	10423.03	2.69	-3.68 ^a	0.37E-31	
Fe I	10423.75	3.07	-3.13 ^a	0.49E-31	
Fe I	10435.36	4.73	-2.11 ^a	0.71E-30	
Si I	10441.47	6.62	-1.83 ^a	0.20E-28 ^M	
Si I	10442.60	6.62	-1.94 ^a	0.20E-28 ^M	
C I	10449.92	8.65	-2.13 ^b	0.45E-30	
Ca I	10452.02	4.74	-1.22 ^b	0.77E-28 ^M	
Fe I	10452.75	3.88	-2.30 ^b	0.50E-31 ^E	
C I	10452.75	9.70	-1.03 ^b	0.16E-28 ^M	
Fe I	10453.15	5.48	-1.94 ^a	0.83E-30	
S I	10455.46	6.86	0.33 ^a	0.19E-30	
Fe I	10455.46	5.39	-1.14 ^f	0.65E-30	
S I	10456.76	6.86	-0.47 ^a	0.19E-30	
Ca I	10457.10	4.74	-1.05 ^c	0.76E-28 ^M	
S I	10459.42	6.86	0.08 ^a	0.19E-30	
Ti I	10460.05	2.26	-1.47 ^a	0.40E-31	
Fe II	10463.00	6.80	-2.33 ^b	0.30E-30 ^A	
Fe I	10469.66	3.88	-1.37 ^b	0.50E-31	
Fe I	10473.26	5.49	-2.07 ^a	0.85E-30	
Ca I	10481.27	4.74	-0.83 ^a	0.38E-28 ^A	
Cr I	10486.22	3.01	-1.16 ^a	0.14E-30	
Fe II	10490.90	5.55	-2.95 ^a	0.30E-30 ^A	
Ti I	10496.09	0.84	-1.91 ^a	0.21E-31	
N I	10500.27	11.84	-0.30 ^d	0.37E-30	
Fe II	10501.50	5.55	-2.17 ^a	0.30E-30 ^A	
Fe I	10502.40	5.39	-3.24 ^c	0.82E-30 ^E	
Fe I	10506.37	5.52	-2.99 ^b	0.94E-30	
Fe I	10506.65	5.52	-2.10 ^b	0.94E-30	
N I	10506.99	11.84	0.23 ^d	0.37E-30	
Cr I	10509.99	3.01	-1.78 ^a	0.14E-30	
P I	10511.58	6.94	-0.22 ^a	0.18E-30	
N I	10513.37	11.84	-0.10 ^d	0.37E-30	
Ca I	10516.14	4.74	-0.52 ^a	0.31E-28 ^A	
N I	10520.57	11.84	0.26 ^c	0.37E-30	
Fe II	10525.12	5.52	-3.15 ^b	0.80E-31 ^A	
Ca I	10525.47	4.74	-1.40 ^c	0.39E-28 ^A	
Fe I	10526.69	5.54	-2.72 ^b	0.99E-30	
Fe I	10527.08	5.55	-2.47 ^a	0.10E-29	
P I	10529.52	6.95	0.14 ^a	0.18E-30	
Ni I	10530.52	4.11	-1.30 ^a	0.37E-30	
Fe I	10532.24	3.93	-1.76 ^a	0.49E-31 ^E	
N I	10533.78	11.84	-0.11 ^d	0.37E-30	
N I	10539.57	11.84	0.60 ^a	0.37E-30	
C I	10541.23	8.54	-1.27 ^a	0.15E-29	
Fe II	10546.37	9.65	0.91 ^a	0.10E-29 ^A	
N I	10549.64	11.84	0.15 ^d	0.37E-30	
Cr I	10550.06	3.01	-2.66 ^a	0.14E-30	
Ti I	10551.75	1.89	-2.74 ^b	0.25E-31	
Ti I	10552.94	2.25	-1.62 ^a	0.39E-31	
Fe I	10555.65	5.45	-1.39 ^a	0.72E-30	
Fe I	10557.52	5.59	-1.66 ^a	0.86E-30 ^E	
Fe I	10560.90	5.51	-2.60 ^b	0.88E-30	
Fe I	10561.45	3.02	-5.72 ^d	0.47E-31	
Ti I	10565.97	2.24	-2.10 ^b	0.39E-31	
Na I	10566.02	3.75	-1.87 ^b	0.61E-28 ^M	
Fe I	10568.85	5.51	-2.52 ^a	0.86E-30	
Na I	10572.27	3.75	-1.53 ^a	0.61E-28 ^M	
Fe I	10577.14	3.30	-3.28 ^a	0.59E-31	
P I	10581.57	6.99	0.36 ^a	0.19E-30	
Si I	10582.17	6.22	-1.16 ^a	0.46E-29 ^M	
Ti I	10584.65	0.83	-2.01 ^a	0.21E-31	
Si I	10585.14	4.95	-0.06 ^a	0.30E-30	
Ti I	10594.85	3.32	-1.60 ^d	0.36E-30	
P I	10596.89	6.94	-0.28 ^a	0.18E-30	
Si I	10602.82	5.87	-2.15 ^a	0.20E-29 ^M	
Si I	10603.44	4.93	-0.37 ^a	0.29E-30	
Y II	10605.16	1.74	-1.89 ^b	0.30E-31 ^A	
Ti I	10607.73	0.85	-3.16 ^a	0.21E-31	
Fe I	10611.68	6.17	-0.09 ^a	0.82E-29 ^M	
Fe I	10613.15	4.37	-4.00 ^b	0.38E-30	
Fe I	10616.72	3.27	-3.34 ^a	0.57E-31	
Fe I	10618.10	5.52	-2.24 ^a	0.89E-30	
Si I	10627.65	5.86	-0.50 ^a	0.11E-29	
Ti I	10627.65	3.09	-1.95 ^f	0.61E-31	
C I	10631.43	7.68	-3.58 ^d	0.17E-30	
Fe I	10632.21	5.96	-1.69 ^b	0.31E-29	
Fe I	10632.51	5.48	-1.86 ^a	0.77E-30	unlikely
Si I	10633.28	6.12	-2.70 ^b	0.29E-29	
S I	10635.97	8.58	0.38 ^a	0.15E-29 ^A	
Fe I	10642.68	5.92	-1.37 ^a	0.25E-29	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Cr I	10647.65	3.01	-1.78 ^a	0.14E-30	
Fe I	10652.38	5.48	-1.79 ^b	0.77E-30	
Fe II	10655.65	6.81	-2.12 ^b	0.30E-30	
Fe I	10658.49	5.48	-2.32 ^b	0.76E-30	
Si I	10660.97	4.92	-0.32 ^a	0.28E-30	
Ti I	10661.63	0.82	-2.07 ^a	0.20E-31	
Cr I	10667.52	3.01	-1.69 ^a	0.14E-30	
Cr I	10672.14	3.01	-1.57 ^a	0.14E-30	
Ti I	10677.05	0.84	-2.90 ^a	0.21E-31	
P I	10681.37	6.95	-0.26 ^a	0.18E-30	
Fe I	10682.42	4.80	-2.64 ^b	0.74E-30	
C I	10683.09	7.48	0.03 ^a	0.13E-30	
Fe I	10683.09	3.64	-4.09 ^f	0.80E-31	
Ti I	10684.92	2.24	-2.39 ^f	0.41E-31	
C I	10685.36	7.48	-0.30 ^a	0.13E-30	
Fe I	10687.79	5.51	-1.99 ^a	0.83E-30	
Si I	10689.72	5.95	-0.09 ^a	0.15E-29	
C I	10691.26	7.49	0.28 ^a	0.13E-30	
Ti II	10691.26	7.76	0.75 ^f	0.30E-31 ^A	
Fe I	10692.76	3.07	-4.50 ^a	0.48E-31	
Si I	10694.26	5.96	0.10 ^a	0.16E-29	
C I	10700.57	8.54	-2.25 ^b	0.31E-30	
Fe I	10703.04	5.54	-1.88 ^a	0.83E-30 ^E	
Si I	10703.44	6.18	-2.60 ^c	0.24E-29	unlikely
Si I	10704.10	6.18	-2.36 ^a	0.24E-29	
C I	10707.34	7.48	-0.41 ^a	0.13E-30	
Ti I	10709.83	2.25	-2.36 ^c	0.41E-31	
Fe I	10717.82	5.54	-1.68 ^a	0.83E-30 ^E	
Fe I	10721.66	5.51	-1.78 ^a	0.82E-30	
Fe I	10725.19	3.64	-2.98 ^a	0.80E-31	
Ti I	10726.39	0.81	-2.31 ^a	0.20E-31	
Si I	10727.42	5.98	0.29 ^a	0.17E-29	
C I	10729.54	7.49	-0.46 ^a	0.13E-30	
Fe I	10731.96	5.07	-2.37 ^a	0.46E-30 ^E	
Ti I	10732.87	0.83	-2.82 ^a	0.20E-31	
Ge I	10734.06	4.64	0.03 ^b	0.27E-30	
Fe I	10735.52	2.95	-4.96 ^a	0.44E-31	
Fe I	10740.37	2.73	-6.10 ^d	0.37E-31	
Na I	10740.67	3.75	-2.05 ^d	0.54E-28 ^M	
Si I	10741.74	6.62	-1.10 ^a	0.16E-28 ^M	
Ti I	10741.74	3.71	-0.40 ^f	0.58E-30	
Fe I	10742.55	3.64	-3.82 ^b	0.80E-31	
Fe I	10744.54	5.27	-1.80 ^a	0.44E-30	
Na I	10746.44	3.19	-1.42 ^a	0.36E-29 ^M	
Fe I	10746.73	5.54	-2.32 ^b	0.89E-30	
Na I	10747.12	3.75	-1.89 ^b	0.54E-28 ^M	
Si I	10749.39	4.93	-0.21 ^a	0.28E-30	
Fe I	10753.01	3.96	-2.14 ^a	0.49E-31 ^E	
C I	10753.99	7.49	-1.69 ^a	0.13E-30	
Fe I	10754.28	5.59	-1.63 ^a	0.26E-31	
Fe I	10754.76	2.83	-4.39 ^a	0.40E-31	
N I	10757.89	11.84	0.05 ^b	0.34E-30	
Ni I	10762.15	4.15	-3.35 ^a	0.38E-30	⁶² Ni
Ni I	10762.22	4.15	-2.47 ^a	0.38E-30	⁶⁰ Ni
Ni I	10762.28	4.15	-2.05 ^a	0.38E-30	⁵⁸ Ni
Al I	10768.36	4.09	-2.00 ^a	0.31E-29 ^E	
P I	10769.49	6.95	-0.86 ^b	0.18E-30	
Fe I	10771.23	5.59	-1.74 ^a	0.26E-31	
Ti I	10774.87	0.82	-2.98 ^a	0.20E-31	
Fe I	10779.63	3.43	-4.29 ^b	0.13E-30	
Ca I	10780.30	4.74	-1.18 ^b	0.56E-28 ^M	
Fe I	10780.70	3.24	-3.59 ^a	0.55E-31	
Al I	10782.04	4.09	-1.79 ^a	0.31E-29 ^E	
Fe I	10783.05	3.11	-2.80 ^a	0.50E-31	
Si I	10784.56	5.96	-0.72 ^a	0.15E-29	
Fe I	10785.39	5.62	-1.53 ^b	0.88E-30 ^E	
Si I	10786.87	4.93	-0.38 ^a	0.28E-30	
Ca I	10791.45	4.74	-0.68 ^a	0.45E-28 ^M	
Ti I	10792.51	0.85	-3.80 ^d	0.21E-31	
Si I	10796.11	6.18	-1.49 ^a	0.23E-29	
Si I	10797.19	6.18	-2.50 ^a	0.23E-29	
Si I	10799.34	6.19	-2.40 ^a	0.23E-29	
Cr I	10801.36	3.01	-1.77 ^a	0.14E-30	
Ca I	10802.70	4.68	-1.19 ^a	0.30E-28 ^M	
Ca I	10809.08	4.68	-1.08 ^a	0.30E-28 ^M	
Mg I	10811.09	5.95	0.01 ^a	0.64E-29 ^M	
Mg I	10811.09	5.95	-0.16 ^a	0.64E-29 ^M	
Mg I	10811.09	5.95	-0.32 ^a	0.64E-29 ^M	
Mg I	10811.09	5.95	-1.05 ^a	0.64E-29 ^M	
Mg I	10811.09	5.95	-1.05 ^a	0.64E-29 ^M	
Mg I	10811.09	5.95	-1.93 ^a	0.64E-29 ^M	
Mg I	10811.09	5.95	-1.46 ^a	0.64E-29 ^M	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
P I	10813.14	6.99	-0.44 ^a	0.19E-30	
Fe I	10813.60	3.07	-4.68 ^a	0.48E-31	
Cr I	10816.90	3.01	-2.01 ^a	0.14E-30	
Fe I	10818.28	3.96	-2.23 ^a	0.49E-31 ^E	
Ti I	10820.39	3.33	-0.94 ^b	0.60E-31	
S I	10821.18	0.00	-8.55 ^a	0.30E-31 ^A	
Cr I	10821.68	3.01	-1.73 ^a	0.14E-30	
Ca I	10822.67	4.74	-1.11 ^a	0.56E-28 ^M	
Si I	10827.10	4.95	0.23 ^a	0.29E-30	
Ti I	10827.94	0.84	-3.88 ^f	0.21E-31	
Fe I	10828.37	5.45	-2.14 ^b	0.66E-30	
Ca I	10833.38	4.88	-0.43 ^a	0.35E-29 ^A	
Fe I	10833.97	5.59	-1.33 ^a	0.86E-30	
Na I	10834.85	3.62	-2.16 ^a	0.16E-28 ^M	
Na I	10834.85	3.62	-0.86 ^a	0.16E-28 ^M	
Na I	10834.91	3.62	-1.01 ^a	0.16E-28 ^M	
Ca I	10838.98	4.88	0.03 ^a	0.35E-29 ^A	
Si I	10843.86	5.86	-0.05 ^a	0.10E-29	
Fe I	10845.80	5.52	-2.36 ^a	0.82E-30	
Ca I	10846.79	4.74	-0.64 ^a	0.56E-29 ^A	
V I	10848.19	2.50	-1.09 ^c	0.49E-31 ^E	
Fe I	10849.46	5.54	-0.73 ^a	0.83E-30 ^E	
Fe I	10853.00	3.87	-3.27 ^a	0.10E-30 ^A	unlikely
Fe I	10858.11	5.27	-3.09 ^d	0.18E-29 ^E	
Ca I	10858.45	4.74	-1.52 ^b	0.56E-29 ^A	
Ca I	10861.59	4.88	-0.49 ^a	0.32E-29 ^A	
Fe II	10862.64	5.59	-2.11 ^a	0.30E-29 ^A	
Fe I	10863.52	4.73	-1.06 ^a	0.65E-30	
Ca I	10863.87	4.88	-0.60 ^a	0.32E-29 ^A	
Si I	10868.79	6.19	-0.01 ^a	0.23E-29	
Ca I	10869.49	4.88	-0.54 ^f	0.32E-27 ^M	
Si I	10869.54	5.08	0.36 ^a	0.35E-30	
Fe I	10870.36	5.62	-1.42 ^a	0.88E-30 ^E	
Al I	10872.97	4.09	-1.37 ^a	0.45E-29 ^M	
Ca I	10879.88	4.88	-0.51 ^a	0.31E-29 ^A	
Fe I	10881.76	2.85	-3.50 ^a	0.40E-31	
Si I	10882.81	5.98	-0.62 ^a	0.16E-29	
Fe I	10884.26	3.93	-2.18 ^a	0.49E-31	
Si I	10885.35	6.18	-0.10 ^a	0.21E-29	
Ni I	10891.31	4.17	-1.51 ^a	0.39E-30	
Al I	10891.73	4.09	-1.08 ^a	0.45E-29	
Si I	10893.68	6.19	-1.92 ^a	0.23E-29	
Si I	10894.80	6.19	-1.68 ^a	0.23E-29	
Fe I	10896.30	3.07	-2.93 ^a	0.48E-31	
Cr I	10905.72	3.44	-0.70 ^a	0.48E-30	
Ca I	10909.80	4.53	-1.46 ^a	0.14E-29 ^A	
Fe I	10913.04	5.54	-1.71 ^a	0.83E-30 ^E	
Mg II	10914.24	8.86	0.00 ^a	0.30E-30 ^A	
Sr II	10914.88	1.80	-0.59 ^b	0.30E-31 ^A	
Mg II	10915.27	8.86	-1.00 ^b	0.30E-30 ^A	
Fe I	10925.96	5.49	-2.80 ^d	0.71E-30	
Fe I	10946.76	5.46	-1.82 ^b	0.66E-30	
Ge I	10947.41	4.67	0.22 ^b	0.27E-30	
Mg II	10951.78	8.86	-0.33 ^b	0.30E-30 ^A	
Mg I	10953.32	5.93	-0.90 ^b	0.66E-29 ^M	
Mg I	10957.30	5.93	-0.42 ^b	0.66E-29 ^M	
Cr I	10957.30	3.01	-2.07 ^f	0.13E-30	
Co I	10957.30	5.20	-1.87 ^f	0.36E-30	
Mg I	10965.45	5.93	-1.15 ^a	0.66E-29 ^M	
Mg I	10965.45	5.93	-0.23 ^a	0.66E-29 ^M	
Fe I	10970.02	5.99	-1.23 ^a	0.31E-29 ^E	
Fe I	10974.72	5.49	-2.48 ^c	0.70E-30	
Si I	10976.35	5.98	-2.30 ^a	0.15E-29	
Fe I	10976.65	5.54	-1.63 ^a	0.81E-30 ^E	
Si I	10979.31	4.95	-0.60 ^a	0.28E-30	
Ni I	10979.83	4.15	-0.90 ^a	0.37E-30	
Si I	10982.08	6.19	-0.27 ^a	0.21E-29	
Si I	10984.55	6.19	-0.63 ^a	0.21E-29	
Fe I	10987.22	2.83	-3.95 ^a	0.39E-31	
Si I	10991.41	0.78	-7.58 ^a	0.30E-31 ^A	
V I	10993.30	2.50	-1.12 ^b	0.52E-31 ^E	
Si I	11005.13	6.22	-2.12 ^a	0.40E-29 ^M	
Fe I	11013.24	4.80	-1.56 ^a	0.69E-30	
Si I	11013.70	6.21	-1.31 ^a	0.23E-29	
Cr I	11015.53	3.45	-0.58 ^a	0.48E-30	
Si I	11017.97	6.21	0.31 ^a	0.23E-29	
K I	11019.87	2.67	-0.06 ^a	0.90E-29	
K I	11019.87	2.67	-1.36 ^a	0.90E-29	
Fe I	11020.67	5.27	-2.09 ^a	0.41E-30	
K I	11022.67	2.67	-0.18 ^a	0.90E-29	
Fe I	11026.78	3.94	-2.77 ^a	0.49E-31 ^E	
Ni I	11026.78	5.85	-1.64 ^f	0.31E-29 ^E	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Mg I	11032.09	5.95	-2.90 ^a	0.80E-29 ^M	
Mg I	11032.09	5.95	-1.98 ^a	0.80E-29 ^M	
Mg I	11033.67	5.95	-2.33 ^a	0.80E-29 ^M	
Mg I	11033.67	5.95	-2.64 ^a	0.80E-29 ^M	
Mg I	11034.48	5.95	-2.59 ^a	0.80E-29 ^M	
Fe I	11038.69	5.54	-2.03 ^b	0.83E-30 ^E	
Si I	11040.41	6.21	-1.75 ^a	0.23E-29	
Cr I	11044.64	3.01	-2.10 ^b	0.13E-30	
Fe I	11045.60	5.59	-1.01 ^a	0.86E-30 ^E	
Fe I	11053.52	3.98	-3.09 ^a	0.49E-31 ^E	
Zn I	11054.26	5.80	-0.50 ^a	0.30E-30	
C I	11056.69	8.64	-2.32 ^a	0.38E-30	
Fe I	11057.77	4.84	-2.06 ^a	0.75E-30	
Fe I	11068.28	3.25	-4.53 ^c	0.55E-31	
Fe I	11071.71	3.07	-3.64 ^a	0.47E-31	
Fe I	11073.41	3.27	-5.40 ^d	0.56E-31	
Fe I	11086.70	5.52	-2.60 ^c	0.76E-30	
Fe I	11087.74	2.28	-4.71 ^a	0.27E-31	
Ni I	11088.58	4.16	-1.81 ^a	0.37E-30	
Co I	11091.85	4.47	-0.85 ^c	0.43E-30	
Fe I	11097.08	5.62	-1.66 ^c	0.88E-30 ^E	
Fe I	11098.19	5.65	-2.26 ^c	0.88E-30 ^E	
Ni I	11114.17	4.17	-2.13 ^c	0.37E-30	
Fe I	11119.80	2.85	-2.54 ^a	0.39E-31	
Fe I	11121.74	5.48	-2.66 ^d	0.60E-30	
Fe I	11122.34	5.34	-2.03 ^b	0.46E-30	
Ge I	11125.12	4.85	0.55 ^a	0.35E-30	
Fe II	11125.58	5.62	-2.27 ^a	0.30E-29 ^A	
Fe I	11127.83	3.30	-3.78 ^a	0.57E-31	
Si I	11130.03	6.21	-0.31 ^b	0.21E-29	
Fe I	11131.33	5.59	-1.34 ^b	0.86E-30 ^E	
Si I	11132.57	6.21	-2.01 ^a	0.21E-29	
Fe I	11135.96	5.31	-1.10 ^d	0.43E-30	
Fe I	11141.58	4.58	-3.33 ^b	0.24E-30	
Ni I	11144.97	5.61	-0.58 ^d	0.16E-29 ^E	
Fe I	11149.26	2.83	-2.75 ^d	0.39E-31	
Cr I	11156.95	3.46	-0.44 ^a	0.48E-30	
Fe I	11178.38	5.59	-0.93 ^a	0.86E-30 ^E	
Fe I	11182.04	5.59	-2.01 ^c	0.98E-30	
V I	11182.62	2.13	-1.70 ^d	0.55E-31	
P I	11183.20	7.21	0.22 ^a	0.24E-30	
Si I	11187.59	6.18	0.08 ^c	0.18E-29	
Fe I	11188.45	6.24	-0.10 ^d	0.98E-29	
Fe I	11190.02	3.96	-3.19 ^d	0.49E-31 ^E	
Na I	11190.21	3.75	-0.80 ^c	0.35E-28	
V I	11195.34	2.14	-1.60 ^d	0.55E-31	
Fe I	11196.49	5.27	-1.41 ^b	0.39E-30	
Ni I	11196.75	2.74	-1.40 ^d	0.44E-31	
Si I	11201.88	6.18	-0.75 ^a	0.17E-29	
S I	11214.64	8.59	-0.50 ^b	0.54E-29 ^M	
Fe I	11237.10	6.25	-0.22 ^b	0.98E-29	
Ti I	11243.89	3.18	-0.60 ^d	0.50E-31	
Ti I	11246.88	3.15	-0.90 ^d	0.48E-31	
Fe I	11277.48	5.11	-2.15 ^d	0.44E-30 ^E	
Si I	11292.41	6.19	-2.20 ^d	0.18E-29	
O I	11297.75	10.74	0.00 ^c	0.10E-29	
O I	11302.39	10.74	0.10 ^c	0.10E-29	
Si I	11306.98	6.19	-1.80 ^b	0.17E-29	
Si I	11308.40	6.19	-0.90 ^a	0.17E-29	
Cr I	11310.73	3.32	-1.00 ^b	0.60E-31	
Co I	11318.29	3.41	-1.10 ^c	0.49E-31 ^E	
C I	11330.29	8.54	0.33 ^b	0.24E-30	
Cr I	11331.90	3.32	-1.15 ^b	0.60E-31	
C I	11336.09	8.64	-1.50 ^b	0.35E-30	
Fe I	11355.95	3.64	-2.68 ^b	0.75E-31	
Fe I	11359.54	5.62	-1.50 ^b	0.86E-30 ^E	
Cr I	11379.33	3.32	-1.41 ^b	0.60E-31	
Fe I	11388.54	5.62	-0.80 ^b	0.88E-30 ^E	
S I	11390.12	8.42	-0.35 ^b	0.18E-29	
S I	11390.12	8.42	0.51 ^b	0.18E-29	
Cr I	11390.77	3.32	-0.55 ^a	0.60E-31	
Fe I	11390.93	5.59	-1.30 ^b	0.86E-30 ^E	
Fe I	11395.57	5.11	-2.30 ^d	0.43E-30 ^E	
Cr I	11398.06	3.32	-0.80 ^a	0.60E-31	
S I	11398.49	8.42	-0.36 ^b	0.18E-29	
S I	11400.32	8.42	-0.40 ^a	0.18E-29	
S I	11400.32	8.42	-0.10 ^a	0.18E-29	
Fe I	11402.73	4.19	-2.10 ^b	0.88E-31 ^E	
Fe I	11402.73	6.26	-1.20 ^b	0.10E-28	
S I	11403.31	8.42	0.10 ^b	0.18E-29	
S I	11403.31	8.42	-0.28 ^b	0.18E-29	
Na I	11403.78	2.10	-0.25 ^b	0.71E-30	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	11409.92	5.64	-0.93 ^b	0.90E-30 ^E	
Fe I	11410.82	5.92	-0.68 ^b	0.27E-29 ^M	
Fe I	11422.33	2.20	-2.89 ^b	0.25E-31	
Fe I	11427.36	5.64	-1.85 ^d	0.88E-30 ^E	
Ca II	11429.69	9.68	-0.35 ^d	0.80E-29 ^A	
Ca II	11429.69	9.68	-0.46 ^d	0.80E-29 ^A	
Ca II	11429.69	9.68	-1.89 ^d	0.80E-29 ^A	
Fe I	11430.66	5.61	-2.25 ^d	0.88E-30	
Fe I	11431.43	5.51	-2.20 ^d	0.65E-30	
Fe I	11432.85	5.31	-1.90 ^b	0.40E-30	
Fe I	11438.49	5.51	-1.96 ^b	0.65E-30	
Fe I	11439.12	2.85	-2.10 ^d	0.39E-31	
Si I	11448.92	6.21	-2.05 ^d	0.17E-29	
Si I	11465.32	6.21	-1.24 ^b	0.17E-29	
Fe I	11470.98	5.64	-1.70 ^d	0.90E-30 ^E	
Fe I	11474.32	6.14	-1.40 ^d	0.31E-29 ^E	
Fe I	11475.75	5.54	-1.09 ^b	0.81E-30 ^E	
Fe I	11479.94	6.00	-1.60 ^d	0.31E-29	
Fe I	11483.54	5.65	-2.00 ^d	0.90E-30	
Cr I	11484.63	3.32	-0.40 ^b	0.59E-31	
Na I	11489.10	3.75	-1.50 ^d	0.30E-28 ^M	
Fe I	11489.55	6.32	0.16 ^a	0.11E-28	
Si I	11502.72	6.26	-0.89 ^a	0.24E-29	
Si I	11503.51	6.26	-1.81 ^a	0.24E-29	
Fe I	11506.68	5.59	-1.09 ^a	0.86E-30 ^E	
Si I	11518.61	6.73	-1.11 ^c	0.19E-28 ^M	
Fe I	11522.23	3.24	-3.34 ^a	0.53E-31	
Mg I	11522.23	6.12	-1.67 ^f	0.12E-28 ^M	
Fe I	11527.86	5.59	-1.70 ^c	0.86E-30 ^E	
Fe I	11529.75	5.62	-1.36 ^b	0.88E-30 ^E	
Mg I	11540.67	6.12	-1.76 ^b	0.12E-28 ^M	
Fe I	11546.38	5.66	-2.30 ^d	0.90E-30	
C I	11556.46	8.64	-1.88 ^c	0.16E-29	
Fe I	11566.12	6.15	-1.90 ^d	0.31E-29 ^E	
Fe I	11568.34	5.69	-1.92 ^d	0.12E-29	
Fe I	11572.53	6.28	0.19 ^a	0.10E-28	
Fe I	11577.51	6.38	-1.44 ^d	0.13E-28 ^M	
C I	11584.80	8.64	-1.46 ^c	0.16E-29	
Fe I	11585.21	5.65	-1.40 ^d	0.91E-30 ^E	
Ni I	11588.70	4.24	-1.44 ^a	0.39E-30	
Fe I	11589.70	5.34	-2.40 ^d	0.41E-30	
Fe I	11589.92	6.28	-0.45 ^b	0.98E-29	
Si I	11591.51	6.27	-0.41 ^b	0.24E-29	
Si I	11592.32	6.27	-0.66 ^b	0.24E-29	
Ni I	11593.11	4.42	-1.43 ^b	0.53E-30	
Fe I	11593.62	2.22	-2.85 ^b	0.25E-31	
Fe I	11594.54	4.58	-2.12 ^b	0.23E-30	
S I	11601.72	8.58	-0.15 ^b	0.47E-29 ^M	
Fe I	11602.91	5.27	-2.10 ^d	0.35E-30	
Fe I	11607.57	2.20	-2.46 ^b	0.25E-31	
Si I	11608.34	6.22	-2.42 ^d	0.30E-29	
Fe I	11609.62	4.58	-2.63 ^c	0.23E-30	
Si I	11609.83	6.26	-1.14 ^b	0.22E-29	
Cr I	11610.56	3.32	-0.11 ^b	0.58E-31	
Si I	11611.09	6.26	-0.10 ^b	0.22E-29	
C I	11614.47	8.64	-1.99 ^c	0.33E-30	
Fe I	11617.01	5.07	-2.47 ^c	0.36E-30 ^E	
C I	11619.29	8.64	-0.62 ^b	0.32E-30	
Fe I	11625.08	5.59	-2.17 ^d	0.86E-30 ^E	
Si I	11627.56	5.96	-1.83 ^a	0.11E-29	
C I	11628.89	8.64	-0.39 ^b	0.33E-30	
Co I	11630.94	3.41	-1.30 ^b	0.49E-31	
Fe I	11632.11	2.59	-5.30 ^d	0.32E-31	
Fe I	11638.26	2.18	-2.59 ^b	0.24E-31	
Si I	11640.18	5.96	-2.50 ^b	0.11E-29	
Si I	11640.96	6.27	-0.48 ^a	0.24E-29	
Fe I	11641.82	4.58	-2.95 ^b	0.23E-30	
C I	11647.96	8.64	-0.83 ^b	0.32E-30	
C I	11652.91	8.77	-0.87 ^b	0.45E-30	
Fe I	11656.29	6.22	-0.20 ^b	0.70E-29 ^M	
C I	11658.85	8.77	-0.36 ^b	0.45E-30	
C I	11659.70	8.65	-0.07 ^b	0.33E-30	
C I	11669.65	8.77	-0.01 ^a	0.45E-30	
Fe I	11669.65	6.34	-1.56 ^d	0.11E-28	
Fe I	11669.65	4.56	-2.59 ^f	0.44E-30	
C I	11674.14	8.65	-0.90 ^b	0.33E-30	
Fe I	11676.30	4.95	-2.67 ^c	0.88E-30	
Fe I	11681.60	3.55	-3.41 ^b	0.69E-31	
Fe I	11682.25	5.62	-1.42 ^b	0.88E-30 ^E	
Fe I	11689.98	2.22	-2.67 ^a	0.25E-31	
K I	11690.20	1.61	7 0.25 ^a	0.22E-30	
Fe I	11693.21	5.95	-1.60 ^d	0.31E-29 ^M	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	11693.95	5.59	-2.12 ^d	0.86E-30 ^E	
Si I	11700.27	6.27	-0.67 ^a	0.22E-29	
Fe I	11702.22	6.02	-2.05 ^d	0.32E-29 ^M	
Ca I	11712.01	4.68	-1.51 ^b	0.20E-28 ^M	
Ge I	11714.75	4.64	0.10 ^d	0.24E-30	
Fe I	11715.49	5.64	-1.20 ^b	0.90E-30 ^E	
Fe I	11724.49	5.61	-2.20 ^d	0.81E-30	
Fe I	11725.56	5.70	-1.50 ^b	0.11E-29	
Fe I	11728.56	5.01	-2.85 ^d	0.17E-29 ^E	
C I	11728.65	7.95	-3.10 ^d	0.30E-31 ^A	
C I	11734.22	7.95	-3.37 ^d	0.30E-31 ^A	
Fe I	11739.22	6.18	-1.25 ^d	0.58E-29 ^M	
C I	11748.24	8.64	0.40 ^a	0.31E-30	
C I	11753.32	8.65	0.69 ^a	0.31E-30	
C I	11754.79	8.64	0.51 ^a	0.31E-30	
Fe I	11755.99	5.62	-1.84 ^b	0.86E-30 ^E	
C I	11756.38	7.48	-2.71 ^b	0.12E-30	
Ca I	11759.58	4.53	-1.60 ^d	0.83E-29 ^M	
Ca I	11767.60	4.53	-0.80 ^b	0.83E-29 ^M	
Ca I	11769.33	4.53	-1.34 ^c	0.83E-29 ^M	
K I	11769.61	1.62	-0.53 ^b	0.22E-30	
K I	11772.83	1.62	0.40 ^b	0.22E-30	
C I	11777.55	8.64	-0.59 ^a	0.31E-30	
Fe I	11778.42	5.34	-1.75 ^b	0.37E-30	
Fe I	11778.70	5.81	-2.20 ^d	0.18E-29	
Ti I	11780.55	1.44	-2.42 ^b	0.23E-31	
Si I	11783.03	6.72	-1.50 ^c	0.16E-28 ^M	
Fe I	11783.26	2.83	-1.86 ^a	0.38E-31	
Si I	11784.69	5.95	-2.53 ^b	0.10E-29	
Ca I	11793.04	4.53	-1.00 ^c	0.83E-29 ^M	
Fe I	11793.23	5.41	-1.33 ^b	0.81E-30 ^E	
Ca I	11795.76	4.53	-1.95 ^b	0.83E-29 ^M	
Ti I	11797.18	1.43	-2.33 ^b	0.23E-31	
C I	11801.05	8.65	-0.80 ^a	0.31E-30	
Fe I	11808.87	5.27	-2.36 ^c	0.33E-30	
Fe I	11808.87	5.69	-3.03 ^c	0.11E-29	
Si I	11810.62	6.72	-2.15 ^d	0.16E-28 ^M	
Si I	11811.41	6.72	-1.55 ^b	0.16E-28 ^M	
C I	11819.04	8.64	-1.54 ^b	0.15E-29	
C I	11824.03	8.65	-2.40 ^d	0.31E-30	
Fe I	11827.14	4.58	-1.93 ^a	0.22E-30	
Mg I	11828.19	4.35	-0.50 ^a	0.92E-30 ^A	
Fe I	11829.85	5.62	-1.89 ^d	0.86E-30 ^E	
Fe I	11835.50	5.27	-2.15 ^c	0.74E-30	
Ca II	11838.99	6.47	0.24 ^a	0.40E-30 ^A	
Ni I	11841.34	4.24	-2.08 ^a	0.38E-30	
C I	11848.73	8.64	-0.70 ^a	0.15E-29	
Fe I	11852.89	5.31	-3.40 ^d	0.18E-29	
Fe I	11854.24	5.68	-1.69 ^a	0.10E-29	
C I	11862.97	8.64	-0.70 ^a	0.15E-29	
Si I	11863.92	5.98	-1.50 ^a	0.11E-29	
La II	11874.19	0.95	-1.34 ^c	0.30E-31 ^A	
C I	11879.57	8.64	-0.65 ^a	0.15E-29	
Fe I	11879.57	5.62	-1.92 ^f	0.88E-30 ^E	
Fe I	11880.00	2.56	-5.30 ^d	0.31E-31	
Fe I	11882.86	2.20	-2.20 ^a	0.25E-31	
Fe I	11884.10	2.22	-2.45 ^a	0.25E-31	
Si I	11884.32	6.73	-2.36 ^f	0.16E-28 ^M	
Si I	11885.13	6.73	-1.39 ^a	0.16E-28 ^M	
Si I	11885.13	6.73	-1.62 ^a	0.16E-28 ^M	
Fe I	11890.50	5.54	-0.78 ^a	0.83E-30 ^E	
Si I	11890.50	5.08	-2.13 ^f	0.30E-30	
C I	11892.89	8.64	-0.35 ^a	0.15E-29	
Ti I	11892.89	1.43	-1.73 ^f	0.22E-31	
C I	11895.78	8.65	-0.02 ^a	0.15E-29	
Fe I	11896.03	5.64	-1.89 ^d	0.88E-30 ^E	
Si I	11900.03	5.96	-1.79 ^a	0.10E-29	
Fe I	11901.91	5.62	-2.20 ^c	0.86E-30 ^E	
Cr I	11908.01	3.45	-1.84 ^b	0.21E-30	
Fe I	11926.38	4.59	-3.06 ^b	0.23E-30	
Ni I	11927.84	4.27	-2.26 ^b	0.39E-30	
Fe I	11943.38	5.95	-1.10 ^a	0.24E-29	
Ti I	11949.55	1.44	-1.63 ^b	0.23E-31	
Ca II	11949.76	6.47	-0.04 ^b	0.39E-30 ^A	
Ca I	11955.95	4.13	-0.91 ^a	0.23E-29 ^M	
Fe I	11970.49	4.61	-2.20 ^a	0.45E-30	
Fe I	11973.04	2.18	-2.28 ^b	0.24E-31	
Ti I	11973.86	1.46	-1.63 ^a	0.23E-31	
Si I	11984.23	4.93	0.12 ^a	0.24E-30	
Fe I	11989.51	6.28	-0.84 ^a	0.63E-29 ^M	
Fe I	11989.51	6.14	-3.13 ^f	0.54E-29 ^M	
Fe I	11990.39	5.39	8-1.61 ^a	0.43E-30	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Si I	11991.58	4.92	-0.22 ^a	0.24E-30	
Ni I	11994.79	5.31	-0.98 ^a	0.83E-30 ^E	
Cr I	12000.97	3.44	-1.93 ^b	0.21E-30	
Fe I	12005.40	5.59	-0.80 ^a	0.84E-30 ^E	
Fe I	12005.55	5.62	-0.98 ^a	0.86E-30 ^E	
Fe I	12010.59	5.69	-1.58 ^b	0.10E-29	
Si I	12027.95	6.08	-2.31 ^b	0.15E-29	
Si I	12031.53	4.95	0.24 ^a	0.25E-30	
Mg I	12039.84	5.75	-1.55 ^a	0.33E-29 ^M	
Fe I	12044.13	4.99	-2.38 ^b	0.89E-30	
Cr I	12044.13	3.42	-2.08 ^f	0.20E-30	
Fe I	12053.08	4.56	-1.75 ^a	0.41E-30	
Si I	12080.43	6.26	-1.69 ^a	0.17E-29	
Si I	12082.00	6.26	-0.55 ^a	0.17E-29	
Mg I	12083.27	5.75	-1.30 ^a	0.16E-29	
Mg I	12083.34	5.75	-2.54 ^a	0.16E-29	
Mg I	12083.65	5.75	0.09 ^a	0.16E-29	
Fe I	12087.06	5.39	-2.15 ^a	0.19E-29 ^E	
C I	12087.95	9.70	-0.77 ^a	0.11E-28	
Fe I	12089.76	6.20	-0.93 ^a	0.58E-29 ^M	
Fe I	12092.22	5.59	-1.49 ^a	0.84E-30 ^E	
Si I	12100.18	6.73	-1.56 ^b	0.17E-28 ^M	
Si I	12100.35	6.10	-2.10 ^a	0.16E-29	
Si I	12102.44	6.62	-0.91 ^a	0.11E-28	
Si I	12103.54	4.93	-0.49 ^a	0.24E-30	
Ca I	12105.84	4.55	-0.54 ^a	0.77E-29 ^M	
Si I	12110.67	6.62	-0.30 ^a	0.11E-28	
Fe I	12115.76	6.02	-1.51 ^a	0.32E-29 ^M	
Fe I	12116.76	6.25	-1.18 ^a	0.67E-29 ^M	
Fe I	12119.50	4.59	-1.88 ^a	0.22E-30	
Fe I	12131.18	5.95	-1.22 ^a	0.22E-29	
Fe I	12132.23	5.64	-1.92 ^a	0.90E-30 ^E	
Si I	12133.99	5.98	-1.89 ^a	0.10E-29	
Si I	12139.73	6.62	-2.29 ^c	0.11E-28	
C I	12168.89	9.70	-0.40 ^a	0.11E-28	
Si I	12175.75	6.62	-0.97 ^a	0.11E-28	
Si I	12178.40	6.27	-1.14 ^a	0.17E-29	
Si I	12189.29	6.62	-1.06 ^a	0.11E-28	
Fe I	12190.10	3.63	-2.75 ^a	0.73E-31	
Fe I	12190.59	5.31	-2.50 ^b	0.76E-30	
Si I	12191.44	6.62	-1.49 ^a	0.11E-28	
Si I	12196.70	5.08	-3.27 ^b	0.29E-30	
Fe I	12213.34	4.64	-2.09 ^a	0.46E-30	
Ni I	12216.54	5.28	-0.78 ^a	0.82E-30 ^E	⁵⁸ Ni
Ni I	12216.63	5.28	-1.20 ^a	0.82E-30 ^E	⁶⁰ Ni
Ni I	12216.72	5.28	-2.08 ^a	0.82E-30 ^E	⁶² Ni
Ni I	12216.80	5.28	-2.67 ^a	0.82E-30 ^E	⁶⁴ Ni
Fe I	12225.96	6.24	-1.59 ^c	0.61E-29 ^M	
Fe I	12227.12	4.61	-1.60 ^a	0.44E-30	
C I	12248.73	9.71	-0.65 ^a	0.11E-28	
Ti I	12255.70	3.92	-0.07 ^a	0.75E-30	
Ti I	12264.27	3.90	-0.06 ^b	0.71E-30	
Fe II	12264.39	12.61	-4.01 ^b	0.80E-30 ^A	
C I	12264.46	9.71	-0.25 ^b	0.11E-28	
Si I	12270.71	4.95	-0.54 ^a	0.24E-30	
Fe I	12274.42	5.45	-2.41 ^b	0.46E-30	
Fe I	12283.28	6.17	-0.61 ^a	0.54E-29 ^M	
Fe I	12288.24	6.22	-1.00 ^a	0.58E-29 ^M	
Fe I	12290.57	5.85	-1.60 ^b	0.22E-29 ^M	
Fe I	12290.57	6.28	-1.60 ^b	0.69E-29 ^M	
Fe I	12297.13	4.91	-1.84 ^a	0.73E-30	
Fe I	12299.72	6.27	-1.20 ^b	0.67E-29 ^M	
Fe I	12301.08	5.45	-1.97 ^a	0.20E-29 ^E	
C I	12314.11	9.71	-0.53 ^b	0.11E-28	
Na I	12319.96	3.75	-1.91 ^a	0.17E-28 ^M	
Na I	12319.98	3.75	-0.96 ^a	0.17E-28 ^M	
Fe I	12320.26	5.67	-1.45 ^a	0.84E-30	
C I	12335.68	9.71	-0.61 ^a	0.11E-28	
Fe I	12340.49	2.28	-4.79 ^a	0.25E-31	
Fe I	12342.92	4.64	-1.68 ^a	0.46E-30	
C I	12347.73	9.71	-0.65 ^b	0.11E-28	
Fe I	12376.62	6.13	-1.68 ^b	0.42E-29 ^M	
Ti I	12388.37	2.16	-1.81 ^b	0.19E-31	
Si I	12390.17	5.08	-1.93 ^a	0.29E-30	
Fe I	12393.08	4.96	-2.44 ^b	0.79E-30	
Si I	12395.84	4.95	-1.82 ^a	0.24E-30	
Fe I	12397.08	5.11	-2.76 ^b	0.36E-30 ^E	
Fe I	12410.59	6.28	-1.25 ^b	0.67E-29 ^M	
Fe I	12414.06	5.69	-1.52 ^a	0.88E-30	
Mg I	12417.92	5.93	-1.69 ^a	0.50E-29 ^M	
Mg I	12423.02	5.93	-1.23 ^a	0.50E-29 ^M	
Ni I	12423.67	5.36	-0.72 ^a	0.20E-29 ^E	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
K I	12432.27	1.61	-0.44 ^a	0.11E-29	
Fe I	12432.82	5.68	-1.62 ^a	0.85E-30	
Mg I	12433.45	5.93	-1.00 ^a	0.50E-29 ^M	
Si I	12439.97	5.08	-2.89 ^a	0.29E-30	
Fe I	12446.45	5.84	-1.80 ^b	0.15E-29	
Fe I	12448.79	5.48	-2.24 ^b	0.20E-29 ^E	
Ni I	12449.42	6.10	-0.01 ^a	0.10E-28	
Si I	12458.19	6.38	-1.85 ^a	0.45E-29 ^M	
Fe I	12459.76	5.62	-1.64 ^a	0.88E-30 ^E	
Ti I	12460.70	4.24	0.78 ^a	0.63E-31	
Si I	12470.30	6.76	-1.84 ^a	0.17E-28 ^M	
Fe I	12475.85	5.67	-1.80 ^a	0.80E-30	
Si I	12510.00	6.76	-1.67 ^a	0.17E-28 ^M	
Fe I	12510.53	4.95	-2.05 ^a	0.77E-30	
Fe I	12512.25	4.99	-2.50 ^a	0.83E-30	
Cr I	12521.81	2.71	-1.78 ^a	0.85E-31	
K I	12522.11	1.62	-0.14 ^a	0.11E-29	
Cr I	12532.85	2.71	-2.07 ^a	0.85E-31	
C I	12549.50	8.85	-0.68 ^a	0.45E-30	
Fe I	12557.01	2.28	-4.07 ^a	0.25E-31	
C I	12562.12	8.85	-0.65 ^a	0.45E-30	
C I	12569.04	8.85	-0.72 ^a	0.45E-30	
Fe I	12580.20	5.39	-2.39 ^c	0.82E-30	
Fe I	12581.13	5.95	-1.77 ^c	0.23E-29	
C I	12581.59	8.85	-0.67 ^a	0.45E-30	
Si I	12583.95	6.62	-0.62 ^a	0.10E-28	
Si I	12589.21	6.62	-1.56 ^a	0.10E-28	
Ti I	12600.27	1.44	-2.48 ^b	0.22E-31	
C I	12601.51	8.85	-0.58 ^a	0.45E-30	
Fe I	12606.47	6.07	-1.54 ^b	0.32E-29	
Fe I	12610.20	5.85	-1.86 ^c	0.15E-29	
C I	12614.10	8.85	-0.06 ^a	0.45E-30	
Fe I	12615.93	4.64	-1.77 ^a	0.44E-30	
Si I	12627.70	6.62	-1.07 ^a	0.10E-28	
Fe I	12631.47	5.45	-1.86 ^b	0.43E-30	
Fe I	12631.94	5.68	-2.30 ^d	0.80E-30	
Fe I	12638.72	4.56	-1.00 ^a	0.38E-30	
Fe I	12648.74	4.61	-1.32 ^a	0.41E-30	
Cr I	12651.03	3.85	-1.50 ^b	0.36E-30	
Ni I	12655.60	5.31	-1.11 ^a	0.83E-30 ^E	
Fe I	12667.12	5.59	-1.59 ^a	0.86E-30 ^E	
Fe I	12670.17	5.27	-2.23 ^a	0.26E-30	
Ti I	12671.10	1.43	-2.19 ^a	0.22E-31	
Na I	12679.15	3.62	-0.25 ^a	0.11E-28	
Na I	12679.15	3.62	-0.41 ^a	0.11E-28	
Fe I	12729.96	5.35	-2.09 ^b	0.76E-30	
Fe I	12733.78	5.39	-2.01 ^a	0.19E-29	
Ti I	12738.39	2.71	-0.90 ^b	0.38E-31	
Si I	12738.68	6.80	-1.95 ^b	0.19E-28 ^M	
Fe I	12738.80	5.45	-2.44 ^b	0.20E-29	
Ni I	12743.26	5.28	-0.91 ^a	0.20E-29 ^E	
Ti I	12744.91	2.49	-1.54 ^a	0.27E-31	
Al I	12749.87	4.02	-1.83 ^a	0.24E-29 ^M	
Fe I	12783.45	6.39	-1.39 ^b	0.89E-29 ^M	
Fe I	12789.47	5.01	-1.92 ^a	0.84E-30	
Si I	12799.44	6.62	-1.61 ^a	0.82E-29	
Fe I	12807.16	3.64	-2.76 ^a	0.71E-31	
Fe I	12808.25	4.99	-1.87 ^b	0.80E-30	
Ti I	12811.48	2.16	-1.60 ^b	0.34E-31	
Ca I	12816.05	3.91	-1.27 ^b	0.92E-30 ^E	
Fe I	12819.91	3.02	-5.40 ^c	0.42E-31	
Ti I	12821.67	1.46	-1.67 ^b	0.22E-31	
Ca I	12823.86	3.91	-1.34 ^b	0.92E-30 ^E	
Fe I	12824.87	3.02	-3.68 ^b	0.42E-31	
Ca I	12827.02	3.91	-1.70 ^b	0.92E-30 ^E	
Ti I	12831.41	1.43	-1.85 ^a	0.22E-31	
Fe I	12840.58	4.95	-1.76 ^a	0.74E-30	
Ti I	12840.76	3.72	-0.77 ^b	0.55E-30	
Ti I	12840.76	3.42	-0.95 ^b	0.49E-31	
Ti I	12847.05	1.44	-1.71 ^a	0.22E-31	
Fe I	12879.78	2.28	-3.61 ^a	0.25E-31	
Co I	12879.78	5.50	-1.48 ^f	0.35E-30	
Fe I	12884.64	5.79	-1.74 ^a	0.18E-29 ^E	
Fe I	12896.12	4.91	-1.80 ^a	0.67E-30	
C I	12897.20	9.76	-0.89 ^a	0.11E-28	
Fe I	12897.22	5.31	-3.16 ^f	0.28E-30	
Mn I	12899.50	2.11	-4.27 ^a	0.21E-31	
Mn I	12899.50	2.11	-3.94 ^a	0.21E-31	
Mn I	12899.51	2.11	-3.84 ^a	0.21E-31	
Mn I	12899.52	2.11	-3.97 ^a	0.21E-31	
Mn I	12899.59	2.11	-2.87 ^a	0.21E-31	
Mn I	12899.60	2.11	-2.68 ^a	0.21E-31	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Mn I	12899.62	2.11	-2.63 ^a	0.21E-31	
Mn I	12899.64	2.11	-2.36 ^a	0.21E-31	
Mn I	12899.64	2.11	-2.67 ^a	0.21E-31	
Mn I	12899.67	2.11	-2.86 ^a	0.21E-31	
Mn I	12899.67	2.11	-2.23 ^a	0.21E-31	
Mn I	12899.71	2.11	-2.10 ^a	0.21E-31	
Mn I	12899.76	2.11	-1.98 ^a	0.21E-31	
Mn I	12899.82	2.11	-1.86 ^a	0.21E-31	
Mn I	12899.87	2.11	-1.76 ^a	0.21E-31	
Ca I	12909.08	4.43	-0.50 ^a	0.31E-29 ^E	
Cr I	12910.10	2.71	-1.99 ^a	0.84E-31	
Ti I	12919.90	2.15	-1.74 ^a	0.34E-31	
Cr I	12921.81	2.71	-2.73 ^a	0.84E-31	
Ni I	12932.28	2.74	-3.12 ^a	0.40E-31	⁵⁸ Ni
Ni I	12932.36	2.74	-3.54 ^a	0.40E-31	⁶⁰ Ni
Ni I	12932.38	2.74	-4.42 ^a	0.40E-31	⁶² Ni
Fe I	12933.01	5.02	-1.92 ^a	0.84E-30	
Fe I	12934.67	5.39	-1.28 ^a	0.35E-30	
Cr I	12937.03	2.71	-2.09 ^a	0.84E-31	
Si I	12940.96	6.80	-1.57 ^a	0.17E-28 ^M	
Fe I	12946.54	3.25	-4.23 ^b	0.50E-31	
Ti I	12950.90	3.44	-0.54 ^b	0.55E-31	
Fe I	12962.22	5.68	-2.08 ^a	0.74E-30	
Mn I	12975.72	2.89	-2.56 ^a	0.20E-31	
Mn I	12975.74	2.89	-2.27 ^a	0.20E-31	
Mn I	12975.76	2.89	-2.53 ^a	0.20E-31	
Mn I	12975.78	2.89	-2.05 ^a	0.20E-31	
Mn I	12975.81	2.89	-2.35 ^a	0.20E-31	
Mn I	12975.83	2.89	-3.31 ^a	0.20E-31	
Mn I	12975.85	2.89	-1.87 ^a	0.20E-31	
Mn I	12975.88	2.89	-2.29 ^a	0.20E-31	
Mn I	12975.91	2.89	-3.23 ^a	0.20E-31	
Mn I	12975.94	2.89	-1.71 ^a	0.20E-31	
Mn I	12975.99	2.89	-2.31 ^a	0.20E-31	
Mn I	12976.02	2.89	-3.35 ^a	0.20E-31	
Mn I	12976.05	2.89	-1.57 ^a	0.20E-31	
Mn I	12976.11	2.89	-2.49 ^a	0.20E-31	
Mn I	12976.15	2.89	-3.70 ^a	0.20E-31	
Fe I	12977.36	4.99	-2.84 ^a	0.79E-30	
Ni I	12986.37	5.30	-1.39 ^b	0.20E-29 ^E	
Fe I	12995.67	5.39	-2.44 ^b	0.34E-30	
Fe I	13000.83	5.06	-2.58 ^b	0.91E-30	
Ca I	13001.42	4.44	-1.24 ^a	0.31E-29 ^E	
Fe I	13006.70	2.99	-3.49 ^a	0.41E-31	
Ti I	13011.90	1.44	-2.50 ^a	0.22E-31	
Fe I	13014.85	5.45	-1.68 ^a	0.39E-30	
Si I	13029.54	6.08	-1.37 ^a	0.11E-29	
Si I	13030.97	6.08	-0.99 ^a	0.11E-29	
Ca I	13033.56	4.44	-0.31 ^a	0.31E-29 ^E	
Fe I	13039.66	5.66	-1.32 ^a	0.67E-30	
Ni I	13047.94	4.54	-3.30 ^a	0.54E-30	⁶⁴ Ni
Ni I	13048.04	4.54	-2.71 ^a	0.54E-30	⁶² Ni
Ni I	13048.12	4.54	-1.83 ^a	0.54E-30	⁶⁰ Ni
Ni I	13048.22	4.54	-1.41 ^a	0.54E-30	⁵⁸ Ni
Zn I	13053.64	6.65	0.13 ^a	0.46E-30	
Fe I	13057.55	5.51	-2.13 ^a	0.46E-30	
Ca I	13057.87	4.44	-1.13 ^a	0.31E-29 ^E	
Fe I	13062.15	5.48	-1.98 ^b	0.42E-30	
Ti I	13077.27	1.46	-2.34 ^a	0.29E-31	
Fe I	13077.34	5.07	-2.03 ^f	0.30E-30 ^E	
Si I	13086.04	6.08	-2.20 ^a	0.11E-29	
Ca I	13086.44	4.44	-0.90 ^a	0.31E-29 ^E	
Fe I	13098.92	5.01	-1.73 ^a	0.80E-30	
Si I	13102.07	6.08	-0.72 ^d	0.11E-29	
Fe I	13107.97	5.67	-1.85 ^b	0.69E-30	
Fe I	13112.78	6.26	-1.43 ^b	0.52E-29 ^M	
Fe I	13120.47	5.34	-2.49 ^c	0.29E-30	
Al I	13123.44	3.14	0.11 ^a	0.38E-30	
Ni I	13125.46	5.33	-1.77 ^c	0.54E-30	
Ca I	13134.94	4.45	-0.14 ^a	0.31E-29 ^E	
Fe I	13135.23	5.32	-2.60 ^b	0.27E-30	
Fe I	13139.59	5.51	-2.19 ^b	0.45E-30	
Fe I	13147.93	5.39	-0.93 ^a	0.46E-31	
Al I	13150.77	3.14	-0.19 ^a	0.38E-30	
Si I	13152.74	4.92	-2.58 ^a	0.22E-30	
Si I	13154.56	6.62	-1.20 ^a	0.74E-29	
O I	13163.89	10.99	-0.33 ^a	0.12E-29	
O I	13164.86	10.99	-0.11 ^a	0.12E-29	
O I	13165.13	10.99	-0.80 ^a	0.12E-29	
Ca I	13167.78	4.45	-1.23 ^a	0.31E-29 ^E	
Fe I	13170.31	5.81	-1.75 ^a	0.18E-29 ^E	
Fe I	13170.58	5.84	-1.90 ^a	0.12E-29	

TABLE 2—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Si I	13176.91	5.86	-0.30 ^a	0.20E-29 ^E	
Fe I	13176.96	5.48	-2.30 ^f	0.20E-29	
Zn I	13196.62	6.66	-0.48 ^b	0.46E-30	
Fe I	13198.50	6.32	-1.01 ^b	0.51E-29 ^M	
Cr I	13201.16	2.71	-2.08 ^a	0.83E-31	
Fe I	13209.76	6.14	-1.21 ^a	0.31E-29 ^E	
Ni I	13212.45	2.74	-3.04 ^a	0.40E-31	
Cr I	13217.02	2.71	-2.52 ^b	0.83E-31	
Fe I	13222.53	5.66	-1.92 ^b	0.65E-30	
Fe I	13222.62	5.51	-2.29 ^b	0.45E-30	
Fe I	13223.11	5.68	-2.20 ^b	0.69E-30	
Fe I	13230.71	6.18	-1.57 ^b	0.31E-29	
Fe I	13260.75	5.01	-2.03 ^a	0.74E-30	
Fe I	13260.75	5.45	-1.10 ^a	0.37E-30	
Ni I	13264.17	5.28	-1.03 ^a	0.81E-30 ^E	
Mn I	13281.30	2.92	-2.69 ^a	0.20E-31	
Mn I	13281.32	2.92	-2.52 ^a	0.20E-31	
Mn I	13281.33	2.92	-2.84 ^a	0.20E-31	
Mn I	13281.37	2.92	-2.29 ^a	0.20E-31	
Mn I	13281.39	2.92	-2.36 ^a	0.20E-31	
Mn I	13281.41	2.92	-2.89 ^a	0.20E-31	
Mn I	13281.48	2.92	-2.01 ^a	0.20E-31	
Mn I	13281.51	2.92	-2.34 ^a	0.20E-31	
Mn I	13281.54	2.92	-3.06 ^a	0.20E-31	
Mn I	13281.63	2.92	-1.80 ^a	0.20E-31	
Mn I	13281.67	2.92	-2.49 ^a	0.20E-31	
Mn I	13281.71	2.92	-3.44 ^a	0.20E-31	
Fe I	13286.86	4.99	-1.53 ^a	0.75E-30	
Si I	13287.58	4.93	-1.45 ^a	0.22E-30	
Fe I	13287.82	2.95	-3.21 ^a	0.39E-31	
Fe I	13289.68	6.12	-1.33 ^a	0.31E-29 ^E	
Fe I	13291.78	5.48	-1.58 ^a	0.40E-30	
Mn I	13293.66	2.14	-3.26 ^a	0.21E-31	
Mn I	13293.67	2.14	-3.08 ^a	0.21E-31	
Mn I	13293.69	2.14	-3.05 ^a	0.21E-31	
Mn I	13293.71	2.14	-3.11 ^a	0.21E-31	
Mn I	13293.73	2.14	-3.31 ^a	0.21E-31	
Mn I	13293.78	2.14	-3.06 ^a	0.21E-31	
Mn I	13293.79	2.14	-2.99 ^a	0.21E-31	
Mn I	13293.79	2.14	-2.82 ^a	0.21E-31	
Mn I	13293.80	2.14	-2.62 ^a	0.21E-31	
Mn I	13293.81	2.14	-2.44 ^a	0.21E-31	
Mn I	13293.82	2.14	-2.27 ^a	0.21E-31	
Mn I	13293.84	2.14	-3.31 ^a	0.21E-31	
Mn I	13293.87	2.14	-3.11 ^a	0.21E-31	
Mn I	13293.90	2.14	-3.05 ^a	0.21E-31	
Mn I	13293.94	2.14	-3.08 ^a	0.21E-31	
Mn I	13293.98	2.14	-3.26 ^a	0.21E-31	
Fe I	13302.29	6.33	-1.01 ^a	0.51E-29 ^M	
Si I	13309.10	6.10	-0.76 ^b	0.11E-29	
Ca I	13318.00	4.62	-0.58 ^a	0.95E-29	
Mn I	13318.76	2.14	-4.14 ^a	0.21E-31	
Mn I	13318.79	2.14	-3.78 ^a	0.21E-31	
Mn I	13318.83	2.14	-3.66 ^a	0.21E-31	
Mn I	13318.86	2.14	-3.74 ^a	0.21E-31	
Mn I	13318.90	2.14	-2.92 ^a	0.21E-31	
Mn I	13318.90	2.14	-2.74 ^a	0.21E-31	
Mn I	13318.91	2.14	-2.72 ^a	0.21E-31	
Mn I	13318.91	2.14	-2.78 ^a	0.21E-31	
Mn I	13318.92	2.14	-2.96 ^a	0.21E-31	
Mn I	13318.94	2.14	-2.99 ^a	0.21E-31	
Mn I	13318.97	2.14	-2.70 ^a	0.21E-31	
Mn I	13318.99	2.14	-2.48 ^a	0.21E-31	
Mn I	13319.01	2.14	-2.30 ^a	0.21E-31	
Mn I	13319.04	2.14	-2.14 ^a	0.21E-31	
Mn I	13319.06	2.14	-2.00 ^a	0.21E-31	
Si I	13325.64	6.10	-0.55 ^a	0.11E-29	
Fe I	13326.03	6.18	-0.85 ^a	0.31E-29 ^E	
Fe I	13346.79	6.12	-1.36 ^b	0.30E-29	
Fe I	13352.18	5.31	-0.55 ^a	0.62E-30	
Fe I	13366.77	5.07	-2.63 ^c	0.29E-30 ^E	
Fe I	13374.72	3.55	-4.11 ^b	0.64E-31	
Fe I	13384.47	3.02	-4.03 ^b	0.41E-31	
Fe I	13385.24	5.95	-1.59 ^b	0.11E-29 ^E	
Fe I	13389.82	3.02	-4.20 ^b	0.41E-31	
Fe I	13392.11	5.35	-0.25 ^a	0.68E-30	

TABLE 3
LINE LIST IN THE H BAND

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	14903.93	6.45	-0.29 ^a	0.44E-30 ^M	
Fe I	14911.39	5.54	-0.74 ^d	0.83E-30 ^E	
Fe I	14918.21	5.97	-1.39 ^a	0.14E-29 ^E	
Fe I	14924.42	6.36	-1.27 ^a	0.49E-29 ^M	
Fe I	14929.15	5.48	-1.81 ^a	0.30E-30	
Fe I	14931.85	6.33	-1.08 ^a	0.33E-29	
Fe I	14932.68	5.84	-1.97 ^a	0.83E-30	
Fe I	14938.63	6.25	-1.04 ^b	0.31E-29 ^E	
Fe I	14939.64	6.47	-0.10 ^a	0.65E-29 ^M	
Fe I	14943.24	6.45	-0.55 ^a	0.66E-29 ^M	
Fe I	14946.74	5.45	-1.51 ^a	0.25E-30	
Fe I	14947.81	5.51	-2.26 ^a	0.32E-30	
Fe I	14956.15	5.54	-0.32 ^a	0.83E-30	
Fe I	14956.57	5.07	-1.55 ^a	0.25E-30 ^E	
Fe I	14959.22	6.37	-0.13 ^a	0.44E-29 ^M	
Fe I	14962.96	5.46	-2.67 ^b	0.28E-30	
Fe I	14968.33	6.28	-0.26 ^a	0.31E-29 ^E	
Fe I	14970.02	5.48	-2.10 ^b	0.30E-30	
Fe I	14978.96	6.18	-1.19 ^a	0.24E-29	
Fe I	14979.72	6.17	-0.64 ^a	0.23E-29	
Fe I	14982.05	5.79	-2.10 ^b	0.64E-30	
Fe I	14982.82	6.26	-0.69 ^a	0.21E-29	
Fe I	14984.18	6.26	-1.10 ^a	0.21E-29	
Fe I	14988.78	6.17	-0.08 ^a	0.23E-29	
Fe I	14990.16	6.45	-1.73 ^b	0.30E-31 ^A	
Fe I	15004.02	6.27	-1.55 ^b	0.36E-29 ^M	
Fe I	15007.69	6.32	-1.00 ^a	0.42E-29 ^M	
Fe I	15009.49	6.33	-2.04 ^b	0.43E-29 ^M	
Fe I	15009.49	6.34	-2.04 ^b	0.44E-29 ^M	
Fe I	15013.76	6.22	-0.47 ^a	0.30E-29	
Fe I	15015.46	6.27	-1.35 ^a	0.31E-29 ^E	
Ti I	15016.15	2.24	-2.36 ^b	0.48E-31	
Fe I	15017.72	6.22	-0.21 ^a	0.30E-29	
Fe I	15022.31	6.41	-0.65 ^a	0.51E-29 ^M	
Mg I	15025.01	5.11	0.03 ^a	0.56E-30	
Fe I	15030.65	6.25	-0.77 ^b	0.31E-29 ^E	
Ni I	15032.31	5.26	-1.37 ^b	0.33E-30	
Fe I	15036.47	5.80	-2.07 ^b	0.64E-30	
Mg I	15040.25	5.11	-0.17 ^b	0.56E-30	
Fe I	15040.32	5.59	-2.57 ^f	0.86E-30 ^E	
Fe I	15046.94	6.43	-0.97 ^c	0.58E-29 ^M	
Mg I	15047.71	5.11	-0.72 ^c	0.56E-30	
C I	15049.94	9.71	-1.71 ^c	0.46E-29 ^M	
Fe I	15051.75	5.35	-0.16 ^a	0.58E-30	
Fe I	15053.38	6.25	-1.58 ^b	0.34E-29 ^M	
Fe I	15053.38	6.32	-1.58 ^b	0.30E-29	
Fe I	15066.96	5.62	-1.52 ^a	0.88E-30	
Ca I	15067.02	4.62	-2.18 ^f	0.56E-29 ^M	
Cr I	15069.30	7.21	0.83 ^b	0.31E-30	
Fe I	15077.30	5.59	-1.53 ^b	0.86E-30 ^E	
Fe I	15077.30	2.18	-4.20 ^f	0.22E-31	
Fe I	15080.22	6.26	-1.19 ^a	0.21E-29	
Ti I	15088.18	2.34	-2.91 ^a	0.53E-31	
Fe I	15094.69	6.36	0.32 ^a	0.41E-29 ^M	
Fe I	15095.20	4.28	-3.08 ^b	0.48E-31 ^E	
Fe I	15095.86	6.22	-0.10 ^a	0.73E-29 ^A	
Ni I	15097.69	5.63	-0.82 ^a	0.15E-29 ^E	
Fe I	15099.10	6.30	-1.06 ^a	0.27E-29	
Fe I	15106.13	6.01	-1.86 ^b	0.13E-29 ^E	
Fe I	15106.13	6.26	-1.86 ^b	0.21E-29	
Fe I	15112.00	6.26	-1.40 ^b	0.21E-29	
Fe I	15112.33	6.26	-1.01 ^b	0.21E-29	
Ni I	15116.69	5.31	-1.01 ^a	0.83E-30	
Ti I	15117.32	2.33	-1.85 ^b	0.52E-31	
Fe I	15118.11	6.26	-1.23 ^b	0.21E-29	
Ca I	15118.17	5.02	-0.65 ^b	0.54E-29 ^A	
Ni I	15119.20	5.47	-1.54 ^c	0.19E-29 ^E	
Fe I	15120.50	5.45	-1.58 ^a	0.27E-30	
Fe I	15122.38	5.62	-0.61 ^a	0.88E-30	
Mg I	15135.32	6.43	-1.91 ^b	0.17E-28	
Fe I	15136.12	5.83	-0.73 ^a	0.97E-30 ^E	
Fe I	15137.07	6.30	-0.95 ^a	0.27E-29	
Fe I	15143.09	5.92	-1.47 ^a	0.11E-29 ^E	
Fe I	15144.05	5.64	-0.77 ^a	0.90E-30 ^E	
Mn I	15159.03	4.89	-0.59 ^a	0.55E-30	
Mn I	15159.03	4.89	-0.72 ^a	0.55E-30	
Mn I	15159.04	4.89	-0.46 ^a	0.55E-30	
Mn I	15159.08	4.89	-0.34 ^a	0.55E-30	
Mn I	15159.14	4.89	-0.22 ^a	0.55E-30	
Mn I	15159.14	4.89	-1.23 ^a	0.55E-30	
Mn I	15159.20	4.89	-1.04 ^a	0.55E-30	
Mn I	15159.21	4.89	-0.12 ^a	0.55E-30	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Mn I	15159.27	4.89	-0.99 ^a	0.55E-30	
Mn I	15159.31	4.89	-2.33 ^a	0.55E-30	
Mn I	15159.36	4.89	-1.03 ^a	0.55E-30	
Mn I	15159.42	4.89	-2.20 ^a	0.55E-30	
Mn I	15159.47	4.89	-1.22 ^a	0.55E-30	
Mn I	15159.55	4.89	-2.30 ^a	0.55E-30	
Mn I	15159.70	4.89	-2.63 ^a	0.55E-30	
Fe I	15159.72	6.30	-0.55 ^a	0.27E-29	
Fe I	15160.50	6.34	-0.47 ^a	0.33E-29	
Fe I	15160.70	6.34	-1.12 ^c	0.33E-29	
Fe I	15160.83	6.34	-1.30 ^c	0.33E-29	
K I	15163.09	2.67	0.40 ^a	0.17E-29	
K I	15163.09	2.67	-0.90 ^a	0.17E-29	
K I	15168.40	2.67	0.24 ^a	0.17E-29	
Ni I	15173.60	5.49	-0.83 ^a	0.95E-30 ^E	
Fe I	15176.72	5.92	-0.95 ^a	0.11E-29 ^E	
Cr I	15178.47	5.24	0.00 ^c	0.48E-29 ^M	
Cr I	15178.79	3.37	-2.40 ^d	0.15E-30	
Fe I	15179.75	5.98	-1.75 ^b	0.11E-29	
Fe I	15194.50	2.22	-4.85 ^a	0.23E-31	
Ni I	15195.27	5.28	-1.40 ^a	0.78E-30	
Fe I	15197.67	6.31	-1.35 ^a	0.27E-29	
Fe I	15198.80	6.31	-1.22 ^a	0.27E-29	
Ni I	15199.62	5.47	-0.68 ^a	0.94E-30 ^E	
Fe I	15201.57	5.49	-1.45 ^a	0.27E-30	
Fe I	15204.10	6.31	-1.31 ^a	0.39E-29 ^M	
Fe I	15207.54	5.39	-0.10 ^a	0.61E-30	
Fe I	15213.02	6.31	-0.83 ^a	0.27E-29	
Fe I	15214.16	6.31	-1.24 ^a	0.27E-29	
Fe I	15216.88	5.51	-2.00 ^b	0.31E-30	
Mn I	15217.41	4.89	-1.00 ^a	0.55E-30	
Mn I	15217.42	4.89	-0.97 ^a	0.55E-30	
Mn I	15217.42	4.89	-1.18 ^a	0.55E-30	
Mn I	15217.43	4.89	-1.03 ^a	0.55E-30	
Mn I	15217.45	4.89	-1.23 ^a	0.55E-30	
Mn I	15217.55	4.89	-0.98 ^a	0.55E-30	
Mn I	15217.57	4.89	-0.91 ^a	0.55E-30	
Mn I	15217.60	4.89	-0.74 ^a	0.55E-30	
Mn I	15217.64	4.89	-0.55 ^a	0.55E-30	
Mn I	15217.66	4.89	-1.23 ^a	0.55E-30	
Mn I	15217.70	4.89	-0.36 ^a	0.55E-30	
Mn I	15217.74	4.89	-1.03 ^a	0.55E-30	
Mn I	15217.76	4.89	-0.19 ^a	0.55E-30	
Mn I	15217.83	4.89	-0.97 ^a	0.55E-30	
Mn I	15217.93	4.89	-1.00 ^a	0.55E-30	
Mn I	15218.04	4.89	-1.18 ^a	0.55E-30	
Fe I	15219.62	5.59	-0.25 ^a	0.84E-30	
Fe I	15224.73	5.96	-0.63 ^a	0.11E-29 ^E	
Ni I	15228.79	5.30	-2.41 ^a	0.34E-30	
Fe I	15229.27	5.51	-2.28 ^a	0.28E-30	
Fe I	15233.67	6.33	-1.12 ^a	0.42E-29 ^M	
Fe I	15237.77	5.79	-1.59 ^b	0.67E-30	
Fe I	15239.74	6.42	-0.15 ^a	0.49E-29 ^M	
Si I	15243.56	6.73	-1.38 ^a	0.67E-29	
Fe I	15244.97	5.59	-0.26 ^a	0.86E-30	
Fe I	15246.49	6.31	-0.86 ^a	0.39E-29 ^M	
Fe I	15246.49	4.14	-3.67 ^f	0.58E-31 ^E	
Fe I	15253.83	6.31	-1.31 ^b	0.39E-29 ^M	
Fe I	15259.36	5.83	-1.85 ^b	0.75E-30	
Fe I	15260.63	6.31	-1.01 ^b	0.26E-29	
Mn I	15261.87	4.89	-2.41 ^a	0.54E-30	
Mn I	15261.96	4.89	-2.06 ^a	0.54E-30	
Mn I	15262.05	4.89	-1.94 ^a	0.54E-30	
Mn I	15262.12	4.89	-2.02 ^a	0.54E-30	
Mn I	15262.16	4.89	-1.20 ^a	0.54E-30	
Mn I	15262.19	4.89	-1.02 ^a	0.54E-30	
Mn I	15262.22	4.89	-1.00 ^a	0.54E-30	
Mn I	15262.24	4.89	-1.06 ^a	0.54E-30	
Mn I	15262.25	4.89	-1.24 ^a	0.54E-30	
Mn I	15262.32	4.89	-1.27 ^a	0.54E-30	
Mn I	15262.37	4.89	-0.98 ^a	0.54E-30	
Mn I	15262.41	4.89	-0.76 ^a	0.54E-30	
Mn I	15262.45	4.89	-0.58 ^a	0.54E-30	
Mn I	15262.48	4.89	-0.42 ^a	0.54E-30	
Mn I	15262.50	4.89	-0.28 ^a	0.54E-30	
Fe I	15263.22	5.94	-2.31 ^b	0.15E-29 ^E	
Fe I	15264.19	6.31	-1.15 ^a	0.31E-29 ^E	
Fe I	15267.02	5.07	-2.49 ^a	0.24E-30	
Fe I	15268.89	6.31	-1.37 ^a	0.26E-29	
Fe I	15277.06	5.91	-1.82 ^a	0.96E-30	
Fe I	15283.65	6.22	-1.46 ^a	0.28E-29	
Fe I	15283.65	6.28	-1.46 ^a	0.21E-29	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	15287.49	6.24	-1.57 ^a	0.30E-29	
Fe I	15289.99	6.28	-0.94 ^a	0.21E-29	
Ni I	15290.71	5.28	-1.08 ^a	0.32E-30	
Ni I	15290.99	6.09	-0.76 ^c	0.45E-29 ^M	
Fe I	15291.36	6.28	-0.92 ^a	0.21E-29	
Fe I	15293.14	6.31	-0.13 ^a	0.31E-29 ^E	
Fe I	15294.56	5.31	0.43 ^b	0.53E-30	
Fe I	15294.89	6.41	0.07 ^b	0.48E-29 ^M	
Fe I	15295.66	6.43	-1.56 ^c	0.30E-29 ^E	
Fe I	15295.91	6.28	-1.23 ^c	0.21E-29	
Fe I	15296.16	5.06	-2.06 ^b	0.71E-30	
Fe I	15297.17	6.35	-1.05 ^a	0.33E-29	
Fe I	15301.56	5.92	-0.84 ^a	0.10E-29 ^E	
Fe I	15305.38	6.18	-1.41 ^b	0.23E-29	
Fe I	15305.60	6.28	-0.72 ^a	0.31E-29 ^E	
Fe I	15311.72	6.28	-1.69 ^b	0.35E-29 ^M	
Fe I	15313.23	6.27	-1.56 ^a	0.31E-29 ^E	
Ti I	15315.60	2.34	-2.33 ^f	0.52E-31	
Fe I	15315.66	6.28	-1.17 ^a	0.31E-29 ^E	
Fe I	15323.55	6.35	-0.94 ^a	0.33E-29	
Ti I	15334.84	1.89	-1.32 ^a	0.36E-31	
Fe I	15335.38	5.41	-0.25 ^a	0.63E-30	
Si I	15338.78	6.26	-2.54 ^a	0.54E-30 ^E	
Fe I	15343.81	5.65	-0.78 ^a	0.91E-30 ^E	
Fe I	15345.01	5.48	-2.01 ^a	0.28E-30	
Fe I	15345.92	6.27	-1.19 ^a	0.31E-29 ^E	
Fe I	15348.95	5.95	-1.04 ^a	0.15E-29 ^E	
Mn I	15348.95	7.01	-1.21 ^f	0.45E-30	
Fe I	15360.23	4.26	-2.92 ^a	0.48E-31 ^E	
Si I	15361.16	5.95	-2.08 ^a	0.20E-29 ^E	
Fe I	15371.32	5.87	-2.24 ^b	0.99E-30 ^E	
Ni I	15371.43	5.30	-3.31 ^a	0.33E-30	62Ni
Ni I	15371.59	5.30	-2.43 ^a	0.33E-30	60Ni
Ni I	15371.75	5.30	-2.01 ^a	0.33E-30	58Ni
Fe I	15375.34	5.92	-1.87 ^a	0.10E-29 ^E	
Si I	15375.43	6.73	-1.39 ^a	0.61E-29 ^M	
Si I	15376.89	6.22	-0.78 ^a	0.10E-29	
Si I	15376.89	6.72	-1.15 ^a	0.64E-29	
Ti I	15381.11	2.33	-2.12 ^c	0.52E-31	
Fe I	15381.98	3.64	-3.03 ^a	0.63E-31	unlikely
Fe I	15384.11	6.20	-1.46 ^a	0.25E-29	
Fe I	15387.80	6.28	-0.27 ^a	0.31E-29	
Fe I	15394.67	5.62	-0.28 ^a	0.76E-30	
Fe I	15395.72	5.62	-0.41 ^a	0.76E-30	
S I	15400.06	8.70	0.10 ^a	0.16E-29	
S I	15403.77	8.70	0.29 ^a	0.16E-29	
S I	15403.77	8.70	-0.62 ^a	0.16E-29	
Fe I	15408.56	5.65	-2.29 ^a	0.20E-29 ^E	
Fe I	15415.85	5.98	-2.10 ^b	0.11E-29 ^E	
S I	15422.26	8.70	-0.62 ^a	0.16E-29	
S I	15422.26	8.70	0.45 ^a	0.16E-29	
S I	15422.26	8.70	-2.16 ^a	0.16E-29	
Fe I	15422.68	6.34	-0.91 ^a	0.30E-29	
Fe I	15426.52	6.16	-2.86 ^d	0.22E-29 ^M	
Ti I	15426.97	1.87	-2.60 ^b	0.36E-31	
Fe I	15427.61	6.45	-0.98 ^a	0.53E-29 ^M	
Fe I	15437.32	5.84	-1.91 ^a	0.68E-30	
Fe I	15441.80	5.87	-1.84 ^a	0.10E-29 ^E	
Fe I	15451.33	6.45	-0.45 ^a	0.53E-29 ^M	
Fe I	15451.94	6.29	-1.29 ^a	0.36E-29 ^M	
Fe I	15451.94	6.34	-1.29 ^a	0.30E-29	
Fe I	15454.25	5.51	-2.44 ^a	0.30E-30	
Fe I	15456.27	6.34	-1.79 ^b	0.30E-29	
Fe I	15462.42	6.29	-2.07 ^b	0.35E-29 ^M	
Ni I	15463.71	5.28	-1.64 ^a	0.18E-29	
S I	15469.82	8.05	-0.40 ^a	0.20E-29	
Fe I	15475.19	6.31	-0.83 ^a	0.31E-29 ^E	
Fe I	15475.19	5.49	-2.11 ^f	0.28E-30	
S I	15475.62	8.05	-0.86 ^a	0.20E-29	
Fe I	15476.50	6.32	-1.14 ^a	0.26E-29	
S I	15478.48	8.05	-0.19 ^a	0.20E-29	
Fe I	15478.87	6.24	-0.63 ^a	0.28E-29	
Fe I	15479.60	6.32	-1.12 ^a	0.26E-29	
Fe I	15480.23	5.61	-2.27 ^a	0.20E-29	
Fe I	15485.45	6.28	-0.93 ^a	0.31E-29 ^E	
Fe I	15490.34	2.20	-4.85 ^a	0.22E-31	
Fe I	15490.88	6.29	-0.65 ^a	0.21E-29	
Fe I	15492.14	5.84	-1.95 ^a	0.75E-30	
Fe I	15493.55	6.45	-0.95 ^a	0.59E-29 ^M	
Fe I	15496.69	6.29	-0.38 ^a	0.21E-29	
Fe I	15497.04	6.29	-1.14 ^b	0.21E-29	
Fe I	15499.41	6.35	-0.41 ^a	0.31E-29	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	15500.80	6.32	-0.22 ^a	0.26E-29	
Fe I	15501.32	6.29	-0.06 ^a	0.21E-29	
Fe I	15502.17	6.35	-1.17 ^a	0.30E-29	
Si I	15506.98	6.73	-1.76 ^a	0.64E-29 ^M	
Fe I	15514.28	6.29	-0.85 ^a	0.21E-29	
Fe I	15515.76	6.29	-1.70 ^b	0.21E-29	
Fe I	15516.72	6.29	-1.33 ^a	0.21E-29	
Fe I	15518.90	6.28	-1.38 ^a	0.31E-29 ^E	
Fe I	15519.10	6.29	-1.19 ^a	0.21E-29	
Fe I	15519.36	6.29	-0.57 ^a	0.35E-29 ^M	
Fe I	15521.69	6.32	-1.44 ^a	0.26E-29	
Fe I	15522.64	6.32	-1.07 ^a	0.26E-29	
Fe I	15524.30	5.79	-1.51 ^a	0.65E-30	
Fe I	15527.21	6.32	-1.01 ^a	0.39E-29 ^M	
Fe I	15531.75	5.64	-0.73 ^a	0.90E-30 ^E	
Fe I	15531.75	6.24	-0.73 ^a	0.15E-29	
Fe I	15534.26	5.64	-0.47 ^a	0.90E-30 ^E	
Fe I	15537.45	5.79	-1.71 ^b	0.65E-30	
Fe I	15537.69	6.32	-0.38 ^a	0.26E-29	
Fe I	15542.09	5.64	-0.70 ^a	0.90E-30 ^E	
Si I	15542.09	7.01	-1.38 ^f	0.19E-28 ^M	
Ti I	15543.78	1.88	-1.48 ^a	0.36E-31	
Fe I	15550.45	6.32	-0.65 ^a	0.26E-29	
Fe I	15550.45	6.36	-0.65 ^a	0.44E-29 ^M	
Fe I	15551.43	6.35	-0.31 ^a	0.30E-29	
Fe I	15554.51	6.28	-1.24 ^a	0.31E-29 ^E	
Fe I	15554.51	6.41	-1.24 ^a	0.50E-29 ^M	
Ni I	15555.12	5.28	-0.61 ^a	0.75E-30	⁵⁸ Ni
Ni I	15555.21	5.28	-1.03 ^a	0.75E-30	⁶⁰ Ni
Ni I	15555.37	5.49	0.00 ^a	0.95E-30 ^E	
Si I	15557.79	5.96	-0.90 ^a	0.20E-29 ^E	
Fe I	15560.78	6.35	-0.55 ^a	0.30E-29	
Fe I	15565.23	6.32	-0.95 ^a	0.26E-29	
Fe I	15566.72	6.35	-0.50 ^a	0.30E-29	
Fe I	15569.24	5.51	-2.36 ^a	0.30E-30	
Fe I	15571.12	5.88	-1.69 ^a	0.83E-30	
Fe I	15571.74	6.32	-0.90 ^a	0.38E-29 ^M	
Fe I	15574.06	6.31	-1.44 ^a	0.31E-29 ^E	
Fe I	15576.04	5.51	-2.27 ^a	0.29E-30	
Fe I	15579.08	6.32	-0.99 ^a	0.39E-29 ^M	
Fe I	15588.26	6.37	0.22 ^a	0.39E-29 ^M	
Fe I	15588.26	5.49	-2.76 ^f	0.50E-30	
Fe I	15590.05	6.24	-0.55 ^a	0.15E-29	
Fe I	15591.49	6.24	0.36 ^a	0.15E-29	
Fe I	15591.49	6.36	0.36 ^a	0.32E-29	
Fe I	15593.74	5.03	-1.98 ^a	0.64E-30	
Fe I	15598.87	6.24	-0.92 ^a	0.15E-29	
Ti I	15598.89	4.69	-0.03 ^f	0.96E-30	
Ti I	15602.84	2.27	-1.81 ^a	0.49E-31	
Fe I	15604.22	6.24	0.28 ^a	0.15E-29	
Ni I	15605.68	5.30	-0.59 ^a	0.79E-30	⁵⁸ Ni
Ni I	15605.75	5.30	-1.01 ^a	0.79E-30	⁶⁰ Ni
Fe I	15611.15	3.41	-3.20 ^a	0.53E-31	
Fe I	15613.63	6.35	-0.29 ^a	0.30E-29	
Fe I	15614.10	6.35	-0.45 ^a	0.41E-29 ^M	
Fe I	15621.16	6.20	-0.99 ^c	0.23E-29	
Fe I	15621.65	5.54	0.17 ^a	0.80E-30	
Fe I	15629.37	5.95	-1.67 ^a	0.11E-29 ^E	
Fe I	15629.63	4.56	-3.13 ^a	0.28E-30	
Fe I	15631.11	3.64	-3.98 ^a	0.64E-31	
Fe I	15631.95	5.35	-0.15 ^a	0.56E-30	
Ni I	15632.62	5.31	-0.13 ^a	0.80E-30	
Si I	15638.47	6.73	-1.76 ^a	0.58E-29 ^M	
Fe I	15638.95	5.81	-1.81 ^a	0.68E-30	
Fe I	15639.48	6.41	-0.87 ^a	0.45E-29 ^M	
Fe I	15645.01	6.31	-0.54 ^a	0.31E-29 ^E	
Fe I	15647.41	6.33	-1.09 ^a	0.39E-29 ^M	
Fe I	15648.52	5.43	-0.80 ^a	0.63E-30	
Fe I	15652.87	6.25	-0.19 ^a	0.15E-29	
Fe I	15656.64	5.87	-1.90 ^a	0.10E-29 ^E	
Fe I	15662.01	5.83	0.00 ^a	0.97E-30 ^E	
Fe I	15662.32	6.33	-1.02 ^c	0.26E-29	
Fe I	15665.24	5.98	-0.60 ^a	0.11E-29 ^E	
Fe I	15670.13	6.20	-1.04 ^a	0.23E-29	
Fe I	15671.00	6.33	-0.57 ^a	0.26E-29	
Fe I	15671.86	5.92	-1.44 ^a	0.10E-29 ^E	
Fe I	15673.15	6.25	-0.73 ^a	0.15E-29	
Si I	15674.70	7.06	-1.15 ^a	0.18E-28 ^A	
Fe I	15676.59	5.11	-1.98 ^a	0.25E-30 ^E	
Fe I	15677.02	6.25	-0.73 ^a	0.15E-29	
Fe I	15677.52	6.25	0.05 ^a	0.15E-29	
Fe I	15678.34	5.83	-2.03 ^b	0.70E-30	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Cr I	15679.50	4.70	-1.27 ^b	0.98E-30	
Fe I	15682.02	5.41	-2.23 ^a	0.61E-30	
Fe I	15682.51	6.37	-0.40 ^a	0.32E-29	
Fe I	15683.39	5.62	-1.97 ^a	0.88E-30	
Fe I	15686.02	6.33	-0.22 ^a	0.26E-29	
Fe I	15686.44	6.25	0.02 ^a	0.15E-29	
Fe I	15691.85	6.25	0.31 ^a	0.15E-29	
Fe I	15692.75	5.39	-0.69 ^a	0.59E-30	
Fe I	15694.50	6.24	-1.52 ^c	0.27E-29	
Ti I	15698.98	1.89	-2.19 ^a	0.36E-31	
Fe I	15700.09	6.33	-1.08 ^a	0.38E-29 ^M	
P I	15711.52	7.18	-0.48 ^a	0.17E-30	
Ti I	15715.57	1.87	-1.59 ^a	0.36E-31	
Fe I	15723.61	5.62	-0.12 ^a	0.88E-30	
Ni I	15726.22	5.51	-2.78 ^a	0.55E-30	⁶⁴ Ni
Ni I	15726.37	5.51	-2.18 ^a	0.55E-30	⁶² Ni
Ni I	15726.53	5.51	-1.30 ^a	0.55E-30	⁶⁰ Ni
Ni I	15726.69	5.51	-0.88 ^a	0.55E-30	⁵⁸ Ni
C I	15727.40	9.63	-0.96 ^a	0.18E-29	
Fe I	15729.78	5.87	-0.81 ^a	0.99E-30 ^E	
Fe I	15731.41	6.45	-0.66 ^a	0.50E-29 ^M	
Fe I	15733.51	6.25	-0.76 ^a	0.15E-29	
Mg I	15740.71	5.93	-0.54 ^a	0.22E-29	
Fe I	15741.92	5.65	-0.42 ^a	0.91E-30	
Mg I	15748.99	5.93	0.15 ^a	0.22E-29	
Mg I	15748.99	5.93	-0.77 ^a	0.22E-29	
Fe I	15751.71	6.36	-0.85 ^b	0.41E-29 ^M	
Ni I	15753.61	5.47	-0.82 ^a	0.94E-30 ^E	
Fe I	15755.67	6.32	-1.57 ^c	0.37E-29 ^M	
Fe I	15756.04	6.45	-1.27 ^b	0.50E-29 ^M	
Fe I	15761.31	6.25	-0.23 ^a	0.15E-29	
Fe I	15764.32	6.30	-0.35 ^b	0.21E-29	
Fe I	15764.51	6.25	-0.81 ^b	0.15E-29	
Mg I	15765.64	5.93	-1.86 ^a	0.22E-29	
Mg I	15765.75	5.93	-0.67 ^a	0.22E-29	
Mg I	15765.84	5.93	0.07 ^a	0.22E-29	
Fe I	15767.39	5.79	-1.59 ^c	0.62E-30	
Fe I	15767.57	5.95	-1.70 ^c	0.11E-29 ^E	
Fe I	15769.42	5.54	0.40 ^d	0.79E-30	
Fe I	15770.62	6.30	0.18 ^a	0.21E-29	
Fe I	15774.07	6.30	0.25 ^a	0.21E-29	
Si I	15779.00	5.61	-3.53 ^b	0.37E-30	
C I	15784.51	9.63	-0.80 ^a	0.18E-29	
C I	15784.88	9.63	-0.93 ^a	0.18E-29	
Fe I	15789.00	6.25	0.16 ^a	0.15E-29	
Si I	15797.50	6.76	-1.39 ^a	0.62E-29 ^M	
Fe I	15798.23	5.95	-0.80 ^a	0.11E-29 ^E	
Fe I	15798.56	6.25	0.22 ^a	0.15E-29	
Si I	15800.95	6.80	-1.60 ^d	0.74E-29 ^M	
Fe I	15806.28	6.34	-0.79 ^a	0.26E-29	
Fe I	15810.13	5.83	-0.64 ^a	0.99E-30	
Si I	15810.45	7.07	-0.96 ^d	0.29E-28	
Fe I	15812.79	5.61	-2.26 ^a	0.39E-30	
Fe I	15815.70	5.11	-2.53 ^a	0.25E-30 ^E	
Fe I	15816.63	5.96	-0.73 ^a	0.11E-29 ^E	
Fe I	15818.14	5.59	0.24 ^a	0.86E-30	
Fe I	15819.13	6.30	-0.03 ^a	0.21E-29	
Fe I	15821.71	5.64	-0.96 ^a	0.90E-30	
Fe I	15822.82	5.64	-0.23 ^a	0.90E-30	
Ni I	15823.15	5.30	-1.93 ^f	0.18E-29	
Si I	15827.21	7.09	-0.69 ^a	0.34E-28 ^M	
Fe I	15829.29	6.30	-1.10 ^a	0.21E-29	
Fe I	15832.65	6.30	-0.88 ^a	0.21E-29	
Si I	15833.63	6.22	-0.45 ^a	0.96E-30	
Fe I	15834.16	6.30	-0.82 ^a	0.21E-29	
Fe I	15835.16	6.30	0.50 ^a	0.21E-29	
Fe I	15837.08	6.31	-1.34 ^c	0.31E-29 ^E	
Fe I	15837.64	6.30	0.10 ^a	0.21E-29	
Si I	15837.64	7.12	-1.46 ^f	0.41E-28 ^M	
Fe I	15840.19	6.36	-0.40 ^a	0.30E-29	
Fe I	15845.21	5.98	-1.33 ^a	0.11E-29 ^E	
Si I	15849.00	6.73	-1.72 ^a	0.56E-29 ^E	
Fe I	15851.79	6.31	-1.23 ^b	0.35E-29 ^M	
C I	15852.54	9.63	-0.42 ^a	0.17E-29	
Fe I	15852.81	6.36	-1.05 ^a	0.30E-29	
Fe I	15853.31	5.96	-0.80 ^a	0.11E-29 ^E	
Fe I	15854.03	5.07	-2.81 ^c	0.23E-30 ^E	
Fe I	15854.43	6.47	-0.76 ^a	0.53E-29 ^M	
Fe I	15858.66	5.59	-1.34 ^a	0.81E-30	
Cr I	15860.21	4.70	-0.11 ^a	0.98E-30 ^E	
Fe I	15863.74	6.26	-0.04 ^c	0.15E-29	
Fe I	15864.65	6.36	-0.72 ^a	0.30E-29	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	15866.26	5.84	-2.13 ^c	0.70E-30	
Fe I	15868.52	5.59	-0.26 ^a	0.86E-30	
Cr I	15870.56	5.81	0.32 ^c	0.92E-28 ^M	
Fe I	15878.45	5.62	-0.61 ^a	0.88E-30	
Mg I	15879.52	5.95	-2.14 ^a	0.27E-29 ^M	
Mg I	15879.56	5.95	-1.39 ^a	0.27E-29 ^M	
Mg I	15879.60	5.95	-3.31 ^a	0.27E-29 ^M	
Si I	15884.47	5.95	-1.00 ^a	0.20E-29 ^E	
Mg I	15886.19	5.95	-1.66 ^a	0.27E-29 ^M	
Mg I	15886.26	5.95	-2.14 ^a	0.27E-29 ^M	
Fe I	15887.72	6.31	-0.13 ^a	0.21E-29	
Si I	15888.44	5.08	-0.25 ^a	0.23E-30	
Si I	15888.85	7.13	-0.49 ^b	0.44E-28 ^M	
Mg I	15889.52	5.95	-1.91 ^a	0.27E-29 ^M	
Si I	15890.71	6.72	-1.91 ^c	0.58E-29 ^M	
Fe I	15891.17	6.31	-0.49 ^a	0.21E-29	
Fe I	15892.29	6.34	-0.87 ^a	0.26E-29	
Fe I	15892.41	6.31	0.08 ^a	0.21E-29	
Fe I	15892.47	6.34	-0.72 ^a	0.26E-29	
Fe I	15892.96	6.34	0.02 ^a	0.26E-29	
Fe I	15894.75	6.20	-0.68 ^a	0.22E-29	
Fe I	15895.23	6.26	0.20 ^a	0.15E-29	
Fe I	15896.55	6.34	-0.89 ^a	0.26E-29	
Fe I	15897.66	6.31	-0.57 ^a	0.21E-29	
Fe I	15898.02	6.31	0.00 ^a	0.21E-29	
Fe I	15898.25	6.34	-0.34 ^b	0.34E-29 ^M	
Fe I	15898.90	6.31	-1.37 ^c	0.21E-29	
Fe I	15899.25	6.31	-0.43 ^a	0.21E-29	
Si I	15899.71	6.76	-1.27 ^a	0.61E-29 ^M	
Fe I	15901.53	5.92	-0.60 ^a	0.11E-29 ^E	
Fe I	15904.35	6.36	0.25 ^a	0.30E-29	
Mg I	15905.91	6.73	-3.09 ^b	0.14E-27 ^M	
Mg I	15905.91	6.73	-3.39 ^b	0.14E-27 ^M	
Fe I	15906.04	5.62	-0.34 ^b	0.88E-30	
Fe I	15908.56	5.90	-1.88 ^a	0.83E-30	
Fe I	15908.72	6.25	-1.47 ^a	0.30E-29 ^M	
Fe I	15909.08	6.34	-0.89 ^a	0.26E-29	
Fe I	15909.24	6.34	-0.78 ^a	0.26E-29	
Fe I	15911.30	5.87	-0.22 ^a	0.99E-30 ^E	
Mg I	15912.59	6.73	-4.56 ^b	0.14E-27 ^M	
Mg I	15912.59	6.73	-3.55 ^b	0.14E-27 ^M	
Mg I	15912.59	6.73	-2.63 ^b	0.14E-27 ^M	
Fe I	15912.59	6.38	-0.35 ^a	0.32E-29	
Fe I	15912.79	6.38	-1.25 ^a	0.32E-29	
Fe I	15913.63	6.34	-1.17 ^a	0.26E-29	
Si I	15914.12	6.72	-1.80 ^a	0.58E-29 ^M	
Fe I	15917.33	6.45	-0.52 ^a	0.49E-29 ^M	
Fe I	15920.11	6.26	-1.17 ^a	0.15E-29	
Fe I	15920.65	6.26	0.02 ^a	0.15E-29	
Fe I	15920.65	6.62	0.01 ^a	0.11E-28 ^E	
Fe I	15921.09	5.49	-1.62 ^a	0.25E-30	
Fe I	15921.51	6.31	-1.06 ^a	0.35E-29 ^M	
Ni I	15921.74	5.51	-1.49 ^b	0.58E-30 ^E	
Fe I	15922.61	6.34	-1.15 ^b	0.26E-29	
Fe I	15922.74	6.31	-1.22 ^b	0.35E-29 ^M	
Fe I	15928.16	5.95	-0.88 ^a	0.11E-29 ^E	
Fe I	15929.48	6.31	-0.59 ^a	0.21E-29	
Fe I	15934.02	6.31	-0.43 ^a	0.21E-29	
Fe I	15938.11	6.34	-0.98 ^a	0.26E-29	
Fe I	15938.73	6.31	-0.91 ^a	0.21E-29	
Fe I	15938.92	6.37	-0.46 ^a	0.30E-29	
Fe I	15939.11	6.31	-0.82 ^a	0.21E-29	
Fe I	15940.92	5.81	-1.42 ^a	0.97E-30 ^E	
Fe I	15941.85	6.36	-0.04 ^a	0.35E-29 ^M	
Fe I	15943.87	6.37	-0.87 ^a	0.30E-29	
Fe I	15943.87	6.62	-0.87 ^a	0.11E-28 ^E	
Mg I	15948.38	6.59	-1.98 ^a	0.35E-28 ^M	
Fe I	15952.63	6.34	-0.81 ^a	0.38E-29 ^M	
Fe I	15954.09	6.22	-0.56 ^a	0.23E-29	
Mg I	15954.46	6.59	-1.03 ^a	0.35E-28 ^M	
Mg I	15954.46	6.59	-2.18 ^a	0.35E-28 ^M	
Fe I	15954.78	5.81	-1.45 ^b	0.65E-30	
Si I	15960.08	5.98	-0.12 ^a	0.19E-29 ^E	
Fe I	15962.18	6.45	-0.91 ^a	0.54E-29 ^M	
Fe I	15962.56	6.42	-0.12 ^a	0.43E-29 ^M	
P I	15962.56	8.25	0.00 ^f	0.20E-29	
Fe I	15963.30	6.48	-0.92 ^a	0.53E-29 ^M	
Fe I	15964.87	5.92	-0.23 ^a	0.11E-29 ^E	
Fe I	15967.66	6.37	0.13 ^a	0.30E-29	
Fe I	15971.25	6.41	-0.41 ^a	0.21E-29 ^A	
Cr I	15974.02	5.98	0.40 ^b	0.30E-31 ^A	
Fe I	15980.73	6.26	0.60 ^a	0.15E-29	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	15982.08	6.26	-0.61 ^a	0.15E-29	
Fe I	15989.59	5.96	-1.91 ^a	0.11E-29	
Fe I	15997.74	5.92	-0.63 ^a	0.10E-29	
C I	16004.80	9.63	0.09 ^c	0.16E-29	
Fe I	16005.17	6.22	-0.53 ^c	0.23E-29	
Fe I	16006.75	6.35	0.42 ^a	0.26E-29	
Fe I	16007.08	6.35	0.02 ^a	0.26E-29	
Fe I	16008.08	6.26	0.07 ^c	0.15E-29	
Fe I	16009.61	5.43	-0.69 ^a	0.58E-30	
Fe I	16012.86	5.59	-1.97 ^a	0.80E-30	
Ni I	16013.74	5.30	-2.28 ^b	0.77E-30	⁶² Ni
Ni I	16013.83	5.30	-1.40 ^b	0.77E-30	⁶⁰ Ni
Ni I	16013.92	5.30	-0.98 ^b	0.77E-30	⁵⁸ Ni
Fe I	16013.91	6.26	-1.09 ^b	0.15E-29	
Si I	16015.95	6.73	-1.63 ^a	0.52E-29 ^M	
Fe I	16018.72	5.61	-2.17 ^a	0.33E-30	
Fe I	16019.79	6.35	-0.81 ^a	0.26E-29	
C I	16021.42	9.63	-1.58 ^a	0.16E-29	
C I	16021.70	9.63	-0.05 ^a	0.16E-29	
Fe I	16021.71	5.61	-2.25 ^c	0.33E-30	
Fe I	16029.42	6.35	-0.63 ^a	0.26E-29	
Ni I	16033.50	6.20	-0.70 ^a	0.30E-29 ^E	
Fe I	16037.83	6.26	0.02 ^a	0.15E-29	
Fe I	16038.13	2.56	-5.76 ^f	0.27E-31	
Fe I	16039.86	5.65	-1.68 ^a	0.88E-30	
Fe I	16040.65	5.87	-0.07 ^a	0.99E-30 ^E	
Fe I	16041.85	6.26	-1.21 ^a	0.30E-29 ^M	
Fe I	16042.71	6.26	0.06 ^b	0.15E-29	
Fe I	16049.05	6.35	-1.06 ^a	0.39E-29 ^M	
Fe I	16051.74	6.26	-0.95 ^a	0.15E-29	
Si I	16060.02	5.95	-0.66 ^a	0.20E-29 ^E	
Fe I	16070.18	5.96	-0.99 ^a	0.11E-29 ^E	
Fe I	16071.40	6.26	-0.12 ^a	0.15E-29	
Fe I	16072.26	6.35	-0.34 ^a	0.26E-29	
Fe I	16073.87	6.35	-0.69 ^a	0.26E-29	
Fe I	16075.92	6.35	0.10 ^a	0.26E-29	
Fe I	16077.95	2.83	-4.65 ^d	0.33E-31	
Fe I	16082.85	6.28	-1.04 ^a	0.30E-29	
Fe I	16083.04	5.54	-2.34 ^b	0.27E-30	
Fe I	16087.16	6.28	-0.74 ^a	0.30E-29	
Fe I	16088.75	6.35	-0.17 ^a	0.26E-29	
Fe I	16089.69	6.35	-0.82 ^a	0.26E-29	
Si I	16094.80	5.96	-0.25 ^b	0.14E-29 ^E	
Fe I	16100.30	6.35	-0.16 ^a	0.26E-29	
Fe I	16102.41	5.87	0.08 ^a	0.99E-30 ^E	
Fe I	16109.76	3.42	-4.78 ^b	0.55E-31	
Fe I	16115.18	6.39	-0.61 ^a	0.32E-29	
Fe I	16116.01	6.39	0.20 ^a	0.32E-29	
Fe I	16123.24	6.35	-1.17 ^a	0.26E-29	
Fe I	16125.90	6.35	0.54 ^a	0.26E-29	
Fe I	16126.82	5.64	-2.73 ^d	0.88E-30	
Ni I	16129.47	6.36	-0.14 ^b	0.92E-29 ^M	
Fe I	16130.52	5.54	-2.67 ^c	0.27E-30	
Co I	16130.67	5.55	0.23 ^c	0.77E-30	
Si I	16135.08	6.72	-2.89 ^b	0.55E-29 ^M	
Ni I	16136.10	5.49	-0.24 ^a	0.95E-30 ^E	
Ca I	16136.82	4.53	-0.66 ^a	0.31E-29 ^E	
Ca I	16150.76	4.53	-0.34 ^a	0.31E-29 ^E	
Ni I	16152.36	4.54	-3.72 ^a	0.34E-30	⁶⁴ Ni
Ni I	16152.49	4.54	-3.13 ^a	0.34E-30	⁶² Ni
Ni I	16152.63	4.54	-2.25 ^a	0.34E-30	⁶⁰ Ni
Ni I	16152.77	4.54	-1.83 ^a	0.34E-30	⁵⁸ Ni
Fe I	16153.25	5.35	-0.82 ^a	0.51E-30	
Ca I	16155.27	4.53	-0.80 ^a	0.31E-29 ^E	
Fe I	16156.57	5.96	-0.53 ^a	0.11E-29 ^E	
Ca I	16157.37	4.55	-0.26 ^a	0.30E-29 ^E	
Fe I	16159.01	5.52	-2.53 ^a	0.25E-30	
Fe I	16162.87	6.32	-1.02 ^a	0.21E-29	
Si I	16163.71	5.95	-0.99 ^a	0.44E-30	
Fe I	16165.05	6.32	0.73 ^a	0.21E-29	
Fe I	16168.75	6.31	-1.43 ^b	0.31E-29 ^E	
Si I	16170.20	6.73	-1.44 ^a	0.52E-29 ^M	
Fe I	16171.92	6.38	-0.52 ^a	0.30E-29	
Fe I	16175.00	6.38	-0.11 ^a	0.30E-29	
Fe I	16175.00	6.38	-0.21 ^a	0.30E-29	
Fe I	16177.10	6.28	-1.08 ^a	0.31E-29 ^M	
Fe I	16178.02	6.38	-0.52 ^a	0.30E-29	
Fe I	16179.60	6.32	0.00 ^a	0.20E-29	
Fe I	16179.60	5.90	-2.56 ^f	0.73E-30	
Fe I	16180.93	6.28	0.08 ^a	0.15E-29	
Fe I	16182.20	6.32	-0.90 ^a	0.20E-29	
Fe I	16185.82	6.39	0.08 ^a	0.32E-29	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Si I	16186.50	6.76	-1.44 ^a	0.57E-29 ^M	
Fe I	16189.37	5.84	-2.15 ^b	0.61E-30	
Fe I	16191.17	6.02	-1.90 ^b	0.12E-29 ^E	
Fe I	16195.08	6.39	0.12 ^a	0.32E-29	
Fe I	16195.25	6.39	-0.85 ^a	0.32E-29	
Ca I	16197.04	4.53	-0.02 ^a	0.30E-29 ^E	
Fe I	16198.51	5.41	-0.60 ^a	0.56E-30	
Fe I	16201.53	6.38	-0.56 ^a	0.29E-29	
Fe I	16202.71	6.32	-1.37 ^a	0.20E-29	
Fe I	16203.35	6.32	-0.73 ^a	0.35E-29 ^M	
Fe I	16204.27	6.32	0.06 ^a	0.20E-29	
Ti I	16206.70	3.10	-1.13 ^a	0.10E-30	
Fe I	16207.77	6.32	0.36 ^a	0.20E-29	
Fe I	16213.03	6.32	-0.55 ^a	0.20E-29	
Fe I	16213.56	6.28	0.04 ^a	0.15E-29	
Si I	16215.71	5.95	-0.66 ^a	0.43E-30	
Fe I	16225.64	6.38	-0.03 ^a	0.29E-29	
Fe I	16225.64	2.18	-5.26 ^f	0.21E-31	
Fe I	16227.13	5.83	-1.46 ^a	0.59E-30	
Fe I	16228.67	6.38	-1.18 ^a	0.29E-29	
Fe I	16231.67	6.38	0.42 ^a	0.29E-29	
Fe I	16234.19	5.95	-1.86 ^a	0.15E-29 ^E	
Fe I	16235.98	5.92	-0.45 ^a	0.10E-29 ^E	
Fe I	16240.89	6.32	-0.90 ^a	0.21E-29	
Si I	16241.87	5.96	-0.87 ^a	0.44E-30	
Fe I	16243.08	6.28	-1.09 ^a	0.15E-29	
Ti I	16245.27	4.51	0.39 ^a	0.78E-30	
Fe I	16245.79	6.32	-0.80 ^a	0.21E-29	
Fe I	16246.16	6.32	-1.50 ^a	0.21E-29	
Fe I	16246.47	6.28	-0.27 ^a	0.15E-29	
Fe I	16252.57	6.32	-0.50 ^a	0.20E-29	
Co I	16254.28	5.55	0.47 ^a	0.76E-30	
Fe I	16258.93	6.24	-0.90 ^a	0.23E-29	
Fe I	16266.90	5.07	-3.03 ^b	0.21E-30	
Fe I	16272.49	6.28	-0.87 ^a	0.15E-29	
Fe I	16277.50	6.32	-0.51 ^a	0.35E-29 ^M	
Ni I	16278.52	5.53	-3.34 ^c	0.53E-30	64Ni
Ni I	16278.73	5.53	-2.75 ^c	0.53E-30	62Ni
Ni I	16278.83	5.53	-1.87 ^c	0.53E-30	60Ni
Ni I	16279.01	5.53	-1.45 ^c	0.53E-30	58Ni
Fe I	16280.78	5.98	-2.02 ^b	0.90E-30	
Fe I	16284.79	6.40	0.07 ^a	0.32E-29	
Ti I	16284.79	4.26	-1.94 ^f	0.63E-30 ^M	
Fe I	16284.99	6.40	-0.96 ^a	0.32E-29	
Fe I	16288.78	6.48	-1.28 ^a	0.50E-29 ^M	
Fe I	16292.85	5.92	-0.62 ^a	0.10E-29 ^E	
Ni I	16299.54	6.20	0.01 ^a	0.30E-29 ^E	
Ni I	16310.51	5.28	-0.12 ^a	0.71E-30	
Fe I	16316.35	6.28	0.92 ^a	0.15E-29	
Fe I	16318.71	5.92	-0.60 ^a	0.10E-29 ^E	
Fe I	16324.46	5.39	-0.66 ^a	0.53E-30	
Ti I	16330.54	3.11	-1.17 ^a	0.10E-30	
Fe I	16331.53	5.98	-0.61 ^a	0.11E-29 ^E	
Fe I	16333.15	5.64	-1.50 ^a	0.88E-30	
C I	16333.93	9.00	-1.44 ^a	0.35E-30	
Ni I	16335.62	6.22	-0.55 ^a	0.30E-29 ^E	
Fe I	16345.49	6.47	-0.78 ^a	0.48E-29 ^M	
Fe I	16347.04	6.59	-0.48 ^a	0.10E-28	
Ni I	16356.41	5.53	-0.88 ^a	0.30E-31 ^A	unlikely
Ni I	16363.11	5.28	0.28 ^a	0.71E-30	
Mg I	16364.74	6.72	-1.27 ^a	0.91E-28 ^M	
Mg I	16364.74	6.72	-2.33 ^a	0.91E-28 ^M	
Mg I	16364.74	6.72	-2.74 ^a	0.91E-28 ^M	
Mg I	16364.74	6.72	-3.88 ^a	0.91E-28 ^M	
Mg I	16364.84	6.72	-1.43 ^a	0.91E-28 ^M	
Mg I	16364.84	6.72	-2.33 ^a	0.91E-28 ^M	
Mg I	16364.84	6.72	-2.93 ^a	0.91E-28 ^M	
Mg I	16364.95	6.72	-1.60 ^a	0.91E-28 ^M	
Fe I	16366.36	6.36	-0.40 ^a	0.26E-29	
Fe I	16372.50	6.36	-1.38 ^a	0.26E-29	
Na I	16373.87	3.75	-1.30 ^a	0.62E-29 ^M	
Fe I	16376.70	6.36	-1.37 ^b	0.26E-29	
Fe I	16377.42	6.33	-0.72 ^a	0.20E-29	
Fe I	16377.42	6.36	-0.72 ^a	0.26E-29	
Si I	16380.14	5.86	-1.00 ^a	0.32E-30	
Fe I	16380.89	6.36	-0.30 ^a	0.26E-29	
Fe I	16381.21	6.36	-0.63 ^b	0.26E-29	
Si I	16381.55	5.96	-0.65 ^b	0.44E-30	
Fe I	16381.84	6.39	-0.39 ^d	0.30E-29	
Fe I	16382.27	6.28	0.13 ^a	0.15E-29	
Fe I	16384.16	6.36	-0.35 ^a	0.26E-29	
Ni I	16388.75	6.03	-0.27 ^a	0.31E-29	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Na I	16388.85	3.75	-1.25 ^b	0.62E-29 ^M	
Fe I	16390.49	6.55	-1.12 ^a	0.56E-29 ^M	
Fe I	16394.40	5.96	0.00 ^a	0.11E-29 ^E	
Fe I	16396.33	6.28	-0.79 ^a	0.15E-29	
Fe I	16398.20	5.92	-0.24 ^a	0.10E-29 ^E	
Fe I	16398.32	6.36	-0.34 ^a	0.25E-29	
Ti I	16401.52	2.33	-2.34 ^c	0.50E-31	
Fe I	16404.62	6.36	0.18 ^a	0.25E-29	
Ti I	16404.62	5.13	-0.07 ^f	0.25E-29 ^M	
Fe I	16407.82	6.29	-0.26 ^a	0.15E-29	
Ti I	16407.82	3.72	-3.26 ^f	0.62E-31	
Fe I	16410.39	6.28	-1.14 ^a	0.27E-29	
Fe I	16412.20	6.39	-0.99 ^a	0.29E-29	
Si I	16412.98	6.80	-1.06 ^a	0.64E-29 ^M	
Fe I	16414.76	6.36	-1.10 ^a	0.25E-29	
C I	16415.70	9.33	-1.25 ^a	0.30E-29 ^A	
C I	16419.29	9.33	-0.76 ^a	0.30E-29 ^A	
Fe I	16422.79	6.37	-1.13 ^a	0.26E-29	
Fe I	16423.13	6.37	-1.42 ^b	0.26E-29	
Fe I	16430.16	6.36	-1.82 ^c	0.38E-29 ^M	
Fe I	16430.16	6.29	-1.82 ^c	0.31E-29 ^M	
Si I	16434.98	5.96	-1.59 ^a	0.43E-30	
Fe I	16436.63	5.92	-0.56 ^a	0.10E-29 ^E	
Fe I	16440.42	6.29	-0.36 ^a	0.15E-29	
Fe I	16443.46	6.26	-1.64 ^b	0.29E-29 ^M	
Fe I	16444.84	5.83	0.21 ^a	0.97E-30 ^E	
Fe I	16446.54	6.29	-1.29 ^a	0.15E-29	
Fe I	16446.64	6.37	-1.09 ^a	0.30E-31 ^A	
Fe I	16454.40	5.91	-2.18 ^b	0.73E-30	
Fe I	16454.91	5.96	-0.92 ^a	0.11E-29 ^E	
Ni I	16459.55	5.36	-2.18 ^f	0.33E-30	
Cr I	16459.60	7.28	0.43 ^a	0.27E-30	
Fe I	16460.36	5.61	-1.97 ^a	0.18E-29	
C I	16465.01	9.33	-1.36 ^a	0.50E-29 ^A	
Fe I	16466.94	6.39	0.00 ^a	0.29E-29	
C I	16468.57	9.33	-1.10 ^a	0.50E-29 ^A	
C I	16471.00	9.33	-1.25 ^b	0.50E-29 ^A	
Fe I	16471.79	6.37	-0.71 ^a	0.26E-29	
Fe I	16474.09	6.02	-0.60 ^a	0.12E-29 ^E	
Fe I	16476.95	6.29	-0.65 ^a	0.15E-29	
Fe I	16477.98	6.37	-1.03 ^b	0.38E-29 ^M	
Ni I	16480.54	5.28	-0.94 ^a	0.70E-30	
Fe I	16481.24	6.39	-0.42 ^a	0.29E-29	
P I	16482.92	7.21	-0.61 ^a	0.17E-30	
Fe I	16486.69	5.83	0.38 ^a	0.97E-30 ^E	
Fe I	16492.10	6.61	-0.59 ^a	0.73E-29 ^M	
Fe I	16492.51	6.20	-1.31 ^a	0.25E-29 ^M	
Fe I	16494.45	6.39	-0.53 ^a	0.29E-29	
Fe I	16494.74	6.29	-1.05 ^a	0.15E-29	
Ni I	16496.31	6.03	-1.10 ^b	0.30E-29	
C I	16505.14	9.33	-1.10 ^c	0.50E-29 ^A	
Fe I	16506.30	5.95	-0.56 ^a	0.11E-29 ^E	
Fe I	16515.67	5.56	-2.41 ^a	0.27E-30	
Fe I	16517.25	6.29	0.37 ^a	0.15E-29	
Fe I	16519.15	6.36	-1.00 ^a	0.32E-29 ^M	
Fe I	16519.43	6.39	-0.40 ^a	0.29E-29	
Fe I	16521.54	6.29	-0.67 ^a	0.15E-29	
Fe I	16522.10	6.29	-0.19 ^a	0.15E-29	
Ni I	16523.71	6.22	-0.49 ^b	0.30E-29 ^E	
Fe I	16524.49	6.34	0.47 ^a	0.20E-29	
Fe I	16525.13	5.98	-1.73 ^b	0.11E-29 ^E	
Fe I	16525.50	6.36	-0.96 ^a	0.32E-29 ^M	
Fe I	16532.01	6.29	-0.19 ^a	0.15E-29	
Ni I	16536.17	6.02	-0.37 ^a	0.28E-29	
Fe I	16536.41	6.37	-1.28 ^a	0.38E-29 ^M	
Fe I	16538.01	6.29	-0.68 ^a	0.15E-29	
Fe I	16539.21	6.34	-0.23 ^a	0.20E-29	
Fe I	16540.91	6.34	-0.82 ^a	0.20E-29	
Fe I	16541.43	5.95	-0.58 ^a	0.11E-29 ^E	
Fe I	16541.98	6.34	-0.44 ^a	0.20E-29	
S I	16542.67	8.42	-0.50 ^a	0.20E-29 ^A	
Fe I	16544.70	6.34	-0.42 ^a	0.20E-29	
Ni I	16550.40	6.22	0.10 ^a	0.30E-29 ^E	
Fe I	16552.02	6.41	-0.01 ^a	0.32E-29	
Fe I	16556.49	6.40	-1.01 ^b	0.30E-29	
Fe I	16556.68	5.97	-1.76 ^b	0.83E-30	
Fe I	16557.16	6.41	-0.48 ^a	0.32E-29	
Fe I	16559.71	6.40	-0.35 ^a	0.29E-29	
Ca II	16561.06	9.24	0.34 ^c	0.10E-29 ^A	
Fe I	16561.80	5.98	-0.07 ^a	0.11E-29 ^E	
Fe I	16575.25	5.62	-2.19 ^a	0.83E-30	
S I	16576.60	8.42	-1.03 ^a	0.20E-29 ^A	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	16578.07	5.07	-2.95 ^b	0.20E-30	
Ni I	16584.44	5.30	-0.78 ^a	0.74E-30	⁵⁸ Ni
Ni I	16584.54	5.30	-1.20 ^a	0.74E-30	⁶⁰ Ni
Ni I	16584.65	5.30	-2.08 ^a	0.74E-30	⁶² Ni
Ni I	16584.76	5.30	-2.67 ^a	0.74E-30	⁶⁴ Ni
Fe I	16586.06	5.62	-1.53 ^a	0.83E-30	
S I	16587.13	8.42	-1.06 ^a	0.20E-29 ^A	
S I	16587.13	8.42	-1.32 ^a	0.20E-29 ^A	
Fe I	16587.52	6.40	-1.16 ^a	0.29E-29	
Ni I	16589.44	5.47	-0.59 ^a	0.94E-30 ^E	
S I	16590.96	8.42	-1.04 ^a	0.20E-29 ^A	
Fe I	16592.80	5.99	-1.84 ^a	0.90E-30	
Ni I	16593.16	5.61	-1.61 ^b	0.16E-29 ^E	
S I	16593.20	8.42	-0.87 ^b	0.30E-29 ^A	
Mg I	16595.58	6.52	-2.09 ^a	0.17E-28 ^M	
S I	16597.24	8.42	-1.14 ^a	0.30E-29 ^A	
Fe I	16600.30	5.95	-1.75 ^a	0.11E-29 ^E	
Fe I	16601.76	6.22	-1.48 ^a	0.21E-29	
Fe I	16607.65	6.34	-0.59 ^a	0.35E-29 ^M	
Fe I	16612.21	3.40	-4.44 ^a	0.55E-31	
Fe I	16612.79	6.40	-0.08 ^a	0.29E-29	
Fe I	16619.73	5.59	-1.66 ^a	0.77E-30	
Mg I	16621.20	6.73	-2.13 ^a	0.91E-28 ^M	
Mg I	16624.73	6.73	-1.77 ^a	0.91E-28 ^M	
Mg I	16624.73	6.73	-2.26 ^a	0.91E-28 ^M	
Mg I	16632.03	6.73	-1.51 ^a	0.91E-28 ^M	
Mg I	16632.03	6.73	-2.26 ^a	0.91E-28 ^M	
Fe I	16632.51	5.87	-1.13 ^a	0.99E-30 ^E	
Fe I	16645.88	5.96	-0.34 ^a	0.11E-29 ^E	
Fe I	16646.98	6.41	-1.19 ^a	0.30E-29 ^E	
Fe I	16648.24	6.55	-0.45 ^a	0.53E-29 ^M	
Ca II	16649.88	9.24	0.59 ^a	0.50E-29 ^A	
Fe I	16652.23	6.34	-0.65 ^a	0.20E-29	
Fe I	16652.80	6.34	-0.60 ^a	0.20E-29	
Fe I	16653.52	5.98	-0.44 ^a	0.11E-29 ^E	
Fe I	16659.58	6.34	-0.60 ^a	0.11E-29	
Fe I	16659.75	6.34	-0.67 ^b	0.11E-29	
Fe I	16661.39	6.34	-0.07 ^a	0.11E-29	
Fe I	16665.49	6.02	-0.30 ^a	0.12E-29 ^E	
Fe I	16666.79	6.34	-1.47 ^b	0.20E-29	
Ni I	16672.10	5.34	-1.50 ^a	0.17E-29	
Ni I	16673.71	6.03	0.21 ^a	0.29E-29	
Cr I	16674.68	4.39	-1.60 ^b	0.46E-30	
Fe I	16679.17	5.92	-1.05 ^a	0.10E-29 ^E	
Si I	16680.81	5.98	-0.34 ^b	0.44E-30	
Fe I	16685.58	6.34	-0.56 ^a	0.34E-29 ^M	
Fe I	16685.72	6.34	-0.74 ^b	0.34E-29 ^M	
Fe I	16693.11	6.42	-0.41 ^a	0.32E-29	
Ni I	16706.07	6.03	-0.97 ^a	0.28E-29	
Fe I	16707.56	6.45	-0.89 ^a	0.42E-29 ^M	
Fe I	16717.82	6.26	-1.37 ^b	0.28E-29 ^M	
Al I	16718.98	4.09	0.19 ^a	0.30E-30 ^A	
Fe I	16718.98	5.87	-0.15 ^f	0.99E-30 ^E	
Fe I	16720.75	6.38	-0.82 ^a	0.25E-29	
Fe I	16721.46	6.38	-0.52 ^a	0.25E-29	
Fe I	16724.71	6.38	-0.73 ^a	0.25E-29	
Fe I	16725.44	6.38	-0.93 ^a	0.25E-29	
Fe I	16727.08	6.38	-1.47 ^b	0.94E-29 ^M	
Fe I	16728.35	6.35	-1.47 ^a	0.35E-29 ^M	
Fe I	16728.35	6.38	-1.47 ^a	0.25E-29	
Fe I	16739.30	6.38	-0.97 ^a	0.25E-29	
Ni I	16747.36	6.22	-0.71 ^b	0.30E-29 ^E	
Fe I	16747.91	6.30	-1.16 ^b	0.15E-29	
Al I	16750.57	4.09	0.50 ^a	0.30E-30 ^A	
Fe I	16751.34	5.96	-1.97 ^c	0.11E-29 ^E	
Fe I	16752.74	5.92	-1.77 ^b	0.10E-29 ^E	
Fe I	16753.09	6.38	0.07 ^a	0.25E-29	
Co I	16757.64	3.41	-1.67 ^b	0.48E-31	
Ni I	16761.24	6.04	-0.52 ^b	0.29E-29	
Al I	16763.35	4.09	-0.64 ^a	0.20E-29 ^A	
Fe I	16775.14	6.45	-1.30 ^b	0.41E-29 ^M	
Co I	16775.25	5.55	0.00 ^b	0.74E-30	
Fe I	16782.84	6.35	-1.28 ^b	0.20E-29	
Fe I	16783.04	6.30	-0.94 ^a	0.15E-29	
Fe I	16786.60	6.35	-1.15 ^a	0.20E-29	
Fe I	16792.25	6.35	-1.09 ^a	0.20E-29	
Fe I	16794.22	6.57	-0.43 ^a	0.56E-29 ^M	
Fe I	16799.66	5.87	-0.74 ^a	0.99E-30 ^E	
Fe I	16803.50	6.35	-1.27 ^b	0.35E-29 ^M	
Fe I	16807.45	5.83	-1.65 ^a	0.97E-30 ^E	
Fe I	16811.38	6.30	-1.02 ^a	0.15E-29	
Ni I	16815.47	5.30	0.70 ^a	0.72E-30	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Ni I	16818.76	6.04	0.23 ^a	0.29E-29	
Fe I	16822.70	5.11	-2.45 ^a	0.22E-30	
Si I	16828.18	5.98	-1.26 ^a	0.44E-30	
Fe I	16837.82	6.41	-0.49 ^a	0.30E-29	
Fe I	16843.24	5.87	-1.40 ^a	0.99E-30 ^E	
Fe I	16850.92	5.88	-2.23 ^b	0.63E-30	
C I	16855.10	9.68	-0.94 ^a	0.30E-29 ^A	
Fe I	16856.44	6.35	-1.36 ^a	0.20E-29	
Fe I	16856.88	6.35	-1.11 ^a	0.20E-29	
Fe I	16857.11	5.95	-1.87 ^b	0.11E-29 ^E	
Fe I	16857.75	5.72	-1.88 ^a	0.41E-30	
Fe I	16863.46	6.31	-0.74 ^a	0.15E-29	
Fe I	16864.07	6.35	-0.98 ^a	0.20E-29	
Fe I	16864.07	6.22	-1.92 ^f	0.25E-29 ^M	
Fe I	16865.55	6.41	-0.94 ^a	0.29E-29	
Ni I	16867.30	5.47	-0.09 ^a	0.94E-30 ^E	
Fe I	16869.97	6.41	-0.98 ^a	0.29E-29	
Fe I	16874.14	6.35	-0.93 ^a	0.20E-29	
Fe I	16874.90	6.30	-1.37 ^b	0.30E-29 ^M	
Ni I	16875.20	6.04	-0.37 ^a	0.28E-29	
Fe I	16880.77	5.98	-2.15 ^a	0.82E-30	
Fe I	16884.81	5.95	-1.17 ^a	0.11E-29 ^E	
Ti I	16887.18	4.69	0.38 ^a	0.95E-30 ^E	
C I	16888.27	9.69	-0.80 ^a	0.50E-29 ^A	
C I	16888.62	9.69	-0.98 ^a	0.50E-29 ^A	
C I	16890.41	9.00	0.33 ^a	0.50E-30 ^A	
Fe I	16892.39	6.31	-0.99 ^a	0.15E-29	
Fe I	16892.39	6.35	-0.99 ^a	0.20E-29	
Fe I	16893.95	6.30	-1.49 ^a	0.15E-29	
Fe I	16895.20	6.35	-1.01 ^a	0.20E-29	
Fe I	16898.90	6.31	-0.94 ^a	0.15E-29	
Cr I	16898.90	5.32	-1.12 ^f	0.46E-29 ^M	
Fe I	16900.23	6.30	-1.27 ^a	0.15E-29	
Fe I	16910.69	5.87	-1.94 ^a	0.61E-30	
Fe I	16926.61	6.27	-2.33 ^c	0.23E-29	
Fe I	16927.61	6.43	-0.38 ^a	0.32E-29	
Fe I	16927.85	6.43	-1.09 ^a	0.32E-29	
Fe I	16928.63	5.92	-0.92 ^a	0.10E-29 ^E	
Fe I	16931.00	6.31	-1.47 ^a	0.15E-29	
Fe I	16941.43	6.41	-1.36 ^a	0.36E-29 ^M	
Fe I	16942.18	5.74	-2.08 ^a	0.19E-29 ^E	
Ni I	16944.70	5.36	-2.88 ^a	0.31E-30	⁵⁸ Ni
Ni I	16944.91	5.36	-2.29 ^a	0.31E-30	⁶⁰ Ni
Ni I	16945.10	5.36	-1.41 ^a	0.31E-30	⁶² Ni
Fe I	16945.17	6.39	-1.28 ^b	0.25E-29	
Ni I	16945.31	5.36	-0.99 ^a	0.31E-30	⁶⁴ Ni
Fe I	16947.69	6.30	-1.41 ^a	0.30E-29 ^M	
Fe I	16951.81	6.39	-1.26 ^a	0.38E-29 ^M	
Si I	16957.80	7.09	-1.14 ^a	0.25E-28 ^M	
Fe I	16969.91	5.95	-0.37 ^a	0.11E-29 ^E	
C I	16978.12	9.69	-1.12 ^a	0.50E-29 ^A	
Fe I	16979.51	6.28	-1.57 ^a	0.28E-29 ^M	
Fe I	16979.51	6.39	-1.57 ^a	0.25E-29	
Ti I	16992.60	4.49	0.27 ^a	0.71E-30	
Ni I	16996.27	5.30	0.17 ^a	0.72E-30	
Co I	16996.64	3.53	-1.61 ^c	0.48E-31	
Ni I	16998.46	5.28	-1.72 ^a	0.88E-30	
Ni I	17001.03	5.49	0.15 ^a	0.95E-30 ^E	
Fe I	17005.45	6.07	-0.25 ^a	0.12E-29 ^E	
Fe I	17007.47	6.42	-1.08 ^a	0.29E-29	
Fe I	17009.02	6.62	-0.20 ^a	0.99E-29	
Mg I	17010.40	6.73	-2.09 ^c	0.75E-28 ^M	
Fe I	17011.11	5.95	-0.24 ^a	0.11E-29 ^E	
Ti I	17018.03	4.51	0.37 ^a	0.74E-30	
Fe I	17018.63	6.36	-1.45 ^a	0.29E-29 ^M	
Fe I	17019.99	6.30	-1.56 ^a	0.25E-29 ^M	
Fe I	17020.76	5.07	-2.48 ^a	0.20E-30	
Cr I	17027.55	4.10	-1.17 ^b	0.39E-30	
Fe I	17027.62	6.62	-0.67 ^b	0.99E-29	
Fe I	17029.99	6.39	-1.37 ^a	0.38E-29 ^M	
Fe I	17033.68	6.39	-0.84 ^a	0.25E-29	
Fe I	17037.79	6.39	-0.42 ^a	0.25E-29	
C I	17045.16	9.69	-0.25 ^a	0.60E-29 ^A	
Fe I	17047.64	6.39	-1.68 ^b	0.25E-29	
Fe I	17047.64	6.42	-1.68 ^b	0.29E-29	
Fe I	17052.20	6.39	-0.60 ^a	0.25E-29	
Fe I	17064.92	6.57	-0.36 ^a	0.53E-29 ^M	
Fe I	17065.26	6.32	-0.61 ^a	0.30E-29	
Fe I	17067.67	6.37	-0.17 ^a	0.35E-29 ^M	
Fe I	17070.55	6.29	-1.40 ^a	0.28E-29 ^M	
Fe I	17070.55	6.67	-1.40 ^a	0.10E-28 ^E	
Fe I	17071.20	6.42	-1.05 ^a	0.40E-29 ^M	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	17072.86	5.07	-2.41 ^a	0.19E-30	
Fe I	17075.15	5.92	-1.25 ^a	0.10E-29 ^E	
Fe I	17075.15	5.96	-1.55 ^a	0.11E-29 ^E	
Mg I	17085.63	6.73	-1.92 ^a	0.76E-28 ^M	
Fe I	17086.16	6.28	-1.76 ^b	0.23E-29	
C I	17086.25	9.33	-1.85 ^c	0.53E-30 ^E	
Fe I	17094.47	6.42	-1.17 ^a	0.30E-31 ^A	
Fe I	17094.47	6.67	-1.17 ^a	0.10E-28 ^E	
Fe I	17098.23	5.75	-1.90 ^a	0.19E-29 ^E	
Fe I	17100.45	6.36	-1.34 ^a	0.29E-29 ^M	
Mg I	17108.66	5.39	0.02 ^b	0.86E-30	
Fe I	17112.35	6.67	-0.65 ^b	0.10E-28 ^E	
P I	17112.48	8.25	0.42 ^b	0.34E-30	
Ni I	17120.55	6.04	-0.40 ^a	0.27E-29	
Fe I	17121.61	5.94	-1.95 ^a	0.72E-30	
Fe I	17125.31	6.29	-1.55 ^a	0.28E-29 ^M	
Fe I	17131.00	6.35	-0.63 ^a	0.33E-29 ^M	
Fe I	17132.21	6.40	-1.20 ^a	0.25E-29	
Fe I	17132.98	6.40	-1.20 ^a	0.25E-29	
Fe I	17137.10	6.40	-1.09 ^a	0.25E-29	
Fe I	17137.24	6.28	-1.39 ^a	0.23E-29	
Fe I	17138.89	6.36	-1.27 ^a	0.34E-29 ^M	
Fe I	17138.89	6.40	-1.27 ^a	0.38E-29 ^M	
Fe I	17151.67	6.40	-1.20 ^a	0.25E-29	
Si I	17152.70	7.06	-2.02 ^f	0.20E-28 ^M	
Fe I	17152.73	6.68	-1.22 ^a	0.10E-28	
Ni I	17156.06	5.36	-1.43 ^c	0.17E-29	
Cr I	17157.43	4.39	-0.97 ^b	0.44E-30	
Fe I	17159.54	6.32	-1.31 ^a	0.30E-29	
Fe I	17161.12	6.02	-0.32 ^a	0.12E-29 ^E	
Fe I	17166.20	5.95	-0.79 ^a	0.11E-29 ^E	
Fe I	17173.86	6.36	-1.95 ^a	0.20E-29	
Fe I	17173.86	5.98	-2.28 ^f	0.11E-29 ^E	
Fe I	17180.99	6.36	-1.51 ^b	0.20E-29	
Fe I	17190.45	6.62	-0.96 ^a	0.65E-29 ^M	
Fe I	17191.57	6.71	-0.83 ^a	0.10E-28 ^E	
Fe I	17192.84	6.36	-1.25 ^a	0.20E-29	
C I	17194.18	9.70	-2.01 ^b	0.17E-29	
Fe I	17194.57	6.36	-1.50 ^a	0.20E-29	
C I	17194.62	9.70	-1.80 ^b	0.17E-29	
Fe I	17200.34	6.36	-0.91 ^a	0.20E-29	
Fe I	17204.30	6.02	-0.29 ^a	0.12E-29 ^E	
Si I	17205.72	6.08	-1.46 ^a	0.17E-29 ^E	
Fe I	17208.68	5.94	-1.46 ^b	0.71E-30	
Fe I	17218.28	6.33	-1.62 ^c	0.30E-29	
Fe I	17219.55	5.87	-2.19 ^b	0.59E-30	
Fe I	17221.43	6.43	-0.85 ^a	0.30E-29	
Fe I	17224.89	5.75	-1.50 ^a	0.19E-29 ^E	
Si I	17225.62	6.62	-0.14 ^a	0.20E-29	
C I	17227.75	9.69	-1.43 ^b	0.30E-29 ^A	
Fe I	17232.22	5.83	-1.07 ^a	0.97E-30 ^E	
Fe I	17233.22	5.96	-1.07 ^a	0.11E-29 ^E	
C I	17234.46	9.70	0.08 ^a	0.17E-29	
Fe I	17252.29	6.42	-1.54 ^b	0.34E-29 ^M	
Fe I	17253.12	6.37	-1.69 ^b	0.30E-29 ^E	
Fe I	17254.96	6.43	-1.39 ^a	0.29E-29	
Fe I	17257.59	6.32	-0.58 ^a	0.15E-29	
Fe I	17262.14	6.64	-0.88 ^a	0.84E-29 ^M	
Fe I	17263.35	6.32	-1.38 ^a	0.15E-29	
C I	17274.97	9.70	0.20 ^a	0.16E-29	
Fe I	17275.70	6.32	-1.49 ^c	0.15E-29	
Fe I	17276.97	6.32	-1.20 ^b	0.15E-29	
Fe I	17277.50	6.32	-0.69 ^a	0.15E-29	
Fe I	17278.72	6.72	-0.39 ^a	0.10E-28 ^E	
Fe I	17280.81	6.32	-1.72 ^c	0.15E-29	
Fe I	17282.32	6.43	-0.16 ^a	0.29E-29	
Fe I	17286.55	6.32	-1.49 ^a	0.15E-29	
Fe I	17293.12	6.32	-0.81 ^a	0.15E-29	
Fe I	17293.67	6.32	-0.72 ^a	0.15E-29	
Fe I	17301.65	6.24	-0.89 ^a	0.25E-29 ^M	
Fe I	17302.33	6.07	-0.11 ^a	0.12E-29 ^E	
Ni I	17306.56	5.49	-0.63 ^a	0.95E-30 ^E	
Fe I	17310.26	6.32	-0.90 ^a	0.15E-29	
Fe I	17310.89	6.32	-1.24 ^b	0.15E-29	
Fe I	17313.08	6.37	-1.43 ^b	0.30E-29 ^E	
Fe I	17316.89	6.40	-1.11 ^c	0.30E-29 ^E	
Fe I	17318.32	5.95	-1.04 ^a	0.11E-29 ^E	
Fe I	17321.25	5.96	-1.72 ^b	0.11E-29 ^E	
C I	17321.55	9.69	-1.17 ^c	0.30E-29 ^A	
Fe I	17321.73	6.32	-0.95 ^c	0.14E-29	
C I	17323.44	9.70	-0.17 ^a	0.16E-29	
C I	17324.20	9.70	-0.73 ^a	0.16E-29	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Si I	17327.37	6.62	0.30 ^a	0.19E-29	
Fe I	17334.11	6.32	-1.07 ^a	0.15E-29	
C I	17337.34	9.70	-1.02 ^b	0.17E-29	
Fe I	17337.99	6.33	-1.00 ^b	0.29E-29	
C I	17338.58	9.70	0.46 ^a	0.17E-29	
C I	17346.38	9.70	-1.68 ^c	0.17E-29	
Fe I	17359.65	5.61	-2.68 ^c	0.28E-30	
Ni I	17360.71	6.07	-0.29 ^c	0.15E-29	
Fe I	17364.91	6.02	-1.83 ^c	0.12E-29 ^E	
Fe I	17374.67	5.74	-1.65 ^b	0.41E-30	
Ti I	17376.57	4.49	0.33 ^b	0.69E-30	
Ti I	17383.10	4.47	0.23 ^a	0.67E-30	
Ti I	17388.51	4.51	0.48 ^b	0.72E-30	
Fe I	17389.83	5.88	-1.69 ^a	0.59E-30	
Si I	17390.63	6.62	-2.19 ^b	0.19E-29	
Ni I	17399.41	6.07	-0.18 ^a	0.15E-29	
Fe I	17400.59	6.37	-0.61 ^b	0.30E-29 ^E	
Ni I	17401.53	6.07	-0.46 ^b	0.15E-29	
Fe I	17405.36	6.37	-1.40 ^b	0.30E-29 ^E	
Mg I	17407.40	6.72	-0.98 ^a	0.55E-28 ^M	
Mg I	17407.40	6.72	-2.04 ^a	0.55E-28 ^M	
Mg I	17407.53	6.72	-1.14 ^a	0.55E-28 ^M	
Mg I	17407.53	6.72	-2.04 ^a	0.55E-28 ^M	
Mg I	17407.64	6.72	-1.31 ^a	0.55E-28 ^M	
C I	17408.41	9.71	-0.78 ^c	0.17E-29	
Fe I	17409.41	6.25	-0.93 ^b	0.25E-29 ^M	
Fe I	17418.49	6.32	-0.96 ^a	0.30E-29 ^M	
Ni I	17419.17	6.08	-1.25 ^a	0.30E-29	⁶⁰ Ni
Ni I	17419.29	6.08	-0.83 ^a	0.30E-29	⁵⁸ Ni
Fe I	17420.85	3.88	-3.62 ^a	0.12E-30	
C I	17427.40	9.70	-0.40 ^a	0.16E-29	
C I	17428.12	9.70	-1.95 ^a	0.16E-29	
Fe I	17428.13	5.74	-1.88 ^a	0.19E-29 ^E	
Fe I	17432.29	5.88	-1.98 ^b	0.59E-30	
Fe I	17433.67	6.41	-0.43 ^a	0.25E-29	
Fe I	17436.27	6.30	-1.24 ^b	0.28E-29 ^M	
Fe I	17440.61	6.41	-1.39 ^a	0.38E-29 ^M	
Fe I	17442.32	6.33	-1.26 ^a	0.30E-29 ^M	
Ti I	17446.74	4.46	-0.03 ^a	0.65E-30	
C I	17448.58	9.00	-0.16 ^a	0.17E-29	
C I	17450.94	9.71	-0.89 ^b	0.17E-29	
Fe I	17451.20	6.57	-1.27 ^c	0.30E-29 ^E	
C I	17451.31	9.71	-1.24 ^b	0.17E-29	
Fe I	17453.86	6.41	-0.67 ^a	0.25E-29	
Fe I	17453.86	5.98	-2.46 ^f	0.76E-30	
C I	17456.03	9.70	0.06 ^a	0.15E-29	
Fe I	17457.58	5.96	-1.55 ^b	0.11E-29 ^E	
Fe I	17460.06	6.02	-1.58 ^a	0.12E-29 ^E	
Fe I	17461.04	6.64	-0.59 ^a	0.98E-29	
Fe I	17461.31	6.35	-1.62 ^c	0.32E-29 ^M	
Si I	17466.91	6.62	-0.14 ^a	0.19E-29	
Fe I	17467.30	5.11	-2.15 ^b	0.20E-30	
Fe I	17467.61	3.88	-3.60 ^c	0.12E-30	
Fe I	17469.92	6.41	-0.71 ^b	0.25E-29	
Fe I	17473.42	6.41	-1.05 ^b	0.25E-29	
C I	17475.65	9.70	-0.86 ^b	0.15E-29	
C I	17475.91	9.70	-1.02 ^b	0.15E-29	
Fe I	17478.03	6.64	0.11 ^a	0.98E-29	
C I	17478.03	9.71	-1.78 ^b	0.17E-29	
C I	17483.40	9.71	-1.43 ^b	0.17E-29	
Fe I	17488.56	6.41	-0.78 ^a	0.25E-29	
Fe I	17488.56	6.64	-0.78 ^a	0.97E-29	
Fe I	17500.01	5.96	-1.10 ^a	0.11E-29 ^E	
Ni I	17501.64	5.59	-3.06 ^a	0.55E-30	⁶⁴ Ni
Ni I	17501.84	5.59	-2.47 ^a	0.55E-30	⁶² Ni
Ni I	17502.03	5.59	-1.59 ^a	0.55E-30	⁶⁰ Ni
Ni I	17502.23	5.59	-1.17 ^a	0.55E-30	⁵⁸ Ni
C I	17505.66	9.70	0.21 ^a	0.15E-29	
C I	17506.17	9.70	-2.41 ^a	0.15E-29	
Fe I	17508.05	5.11	-2.52 ^a	0.20E-30	
Fe I	17512.20	6.28	-1.60 ^c	0.22E-29	
Fe I	17512.20	6.30	-1.60 ^c	0.28E-29 ^M	
Fe I	17514.00	6.30	-1.33 ^c	0.28E-29 ^M	
Fe I	17514.46	6.38	-1.55 ^c	0.34E-29 ^M	
C I	17515.93	9.00	-2.14 ^f	0.30E-30	
Fe I	17516.09	6.64	-0.31 ^a	0.99E-29	
Fe I	17518.10	3.37	-4.28 ^c	0.56E-31	
Fe I	17518.10	5.87	-1.86 ^c	0.99E-30 ^E	
Fe I	17520.24	5.74	-1.62 ^b	0.41E-30	
C I	17521.28	9.71	-0.56 ^b	0.17E-29	
C I	17521.74	9.71	-1.36 ^b	0.17E-29	
Sc I	17522.77	4.27	2.62 ^b	0.77E-30	unlikely

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
C I	17526.01	9.70	-1.76 ^c	0.15E-29	
C I	17526.26	9.70	-0.80 ^c	0.15E-29	
Fe I	17531.20	6.64	-0.68 ^a	0.98E-29	
Fe I	17534.80	6.64	-0.31 ^a	0.98E-29	
Fe I	17536.93	5.91	-0.97 ^a	0.64E-30	
Fe I	17538.64	5.72	-1.22 ^a	0.38E-30	
Fe I	17538.64	5.95	-1.92 ^f	0.11E-29 ^E	
C I	17545.21	9.71	-0.95 ^a	0.17E-29	
Fe I	17547.70	6.25	-1.64 ^c	0.25E-29 ^M	
Fe I	17548.55	5.96	-0.66 ^a	0.11E-29 ^E	
C I	17548.55	9.00	-3.74 ^f	0.30E-30	
Fe I	17549.14	6.64	-0.52 ^a	0.98E-29	
C I	17551.00	9.71	-0.85 ^b	0.30E-29 ^A	
C I	17551.37	9.71	-1.72 ^b	0.30E-29 ^A	
C I	17554.00	9.71	-1.31 ^a	0.17E-29	
Fe I	17554.15	6.45	-0.56 ^b	0.32E-29	
Fe I	17554.40	6.73	-0.67 ^b	0.10E-28	
C I	17554.47	9.71	-0.15 ^a	0.17E-29	
Fe I	17564.83	5.90	-1.93 ^b	0.62E-30	
Fe I	17569.08	6.73	-0.90 ^b	0.10E-28 ^E	
Fe I	17570.46	6.73	-0.17 ^a	0.10E-28 ^E	
Fe I	17572.42	6.38	-1.37 ^a	0.20E-29	
Fe I	17574.25	6.38	-1.31 ^a	0.20E-29	
Fe I	17575.32	6.40	-1.01 ^a	0.30E-29 ^E	
Fe I	17577.86	6.38	-1.12 ^a	0.20E-29	
Fe I	17581.00	5.96	-1.23 ^c	0.11E-29 ^E	
Fe I	17581.92	6.38	-0.55 ^a	0.20E-29	
Fe I	17590.75	6.43	-1.57 ^c	0.41E-29 ^M	
C I	17592.22	9.00	-1.37 ^a	0.30E-30	
Fe I	17592.48	6.42	-0.71 ^a	0.38E-29 ^M	
Ni I	17604.60	6.26	-0.27 ^c	0.51E-29	
C I	17605.14	9.71	-0.25 ^c	0.16E-29	
Ni I	17607.68	5.41	-1.91 ^b	0.33E-30	⁶² Ni
Ni I	17607.87	5.41	-1.03 ^b	0.33E-30	⁶⁰ Ni
Ni I	17608.03	5.41	-0.61 ^b	0.33E-30	⁵⁸ Ni
Fe I	17608.73	6.45	0.04 ^a	0.32E-29	
Fe I	17611.37	6.42	-0.95 ^b	0.25E-29	
C I	17611.87	9.70	-0.88 ^c	0.15E-29	
Si I	17617.03	6.62	-0.11 ^a	0.18E-29	
Ni I	17617.53	5.77	-1.57 ^c	0.13E-29 ^E	⁶⁰ Ni
Ni I	17617.72	5.77	-1.15 ^c	0.13E-29 ^E	⁵⁸ Ni
C I	17622.15	9.71	-0.58 ^c	0.30E-30 ^A	
Fe I	17622.31	6.42	-1.01 ^d	0.25E-29	
Si I	17623.35	6.62	-0.88 ^b	0.18E-29	
Fe I	17633.86	6.41	-1.37 ^b	0.30E-29 ^E	
C I	17637.38	9.71	0.10 ^b	0.16E-29	
Fe I	17637.38	6.37	-1.18 ^c	0.30E-29 ^E	
C I	17638.18	9.71	-0.83 ^b	0.16E-29	
Fe I	17640.19	5.11	-2.76 ^b	0.20E-30	
Fe I	17647.30	6.61	-1.06 ^a	0.69E-29 ^M	
Fe I	17658.10	6.34	-1.62 ^a	0.15E-29	
C I	17672.06	7.95	-1.92 ^a	0.91E-31	
Fe I	17672.17	5.75	-2.14 ^a	0.41E-30	
Fe I	17672.17	6.36	-2.53 ^a	0.27E-29 ^M	
Ni I	17673.69	6.09	-1.26 ^b	0.30E-31 ^A	⁶⁰ Ni
Ni I	17673.90	6.09	-0.84 ^b	0.30E-31 ^A	⁵⁸ Ni
Ni I	17674.83	6.09	-1.61 ^c	0.30E-31 ^A	⁶⁰ Ni
Ni I	17675.04	6.09	-1.19 ^c	0.30E-31 ^A	⁵⁸ Ni
Fe I	17678.88	6.31	-1.31 ^b	0.28E-29 ^M	
Fe I	17683.92	6.34	0.00 ^a	0.14E-29	
C I	17684.64	7.95	-2.82 ^a	0.91E-31	
Fe I	17689.54	6.34	-0.72 ^a	0.14E-29	
Fe I	17695.94	5.95	-0.65 ^a	0.11E-29 ^E	
Al I	17699.07	4.67	-1.29 ^b	0.58E-29 ^M	
Fe I	17700.86	6.34	-0.98 ^a	0.14E-29	
Fe I	17706.67	5.97	-0.66 ^a	0.71E-30	
Fe I	17706.67	6.58	0.25 ^a	0.76E-29	
Fe I	17707.75	6.34	-1.17 ^b	0.14E-29	
Al I	17708.04	4.67	-1.58 ^b	0.58E-29 ^M	
Cr I	17708.74	4.39	-0.72 ^a	0.43E-30	
Fe I	17709.84	6.26	-1.41 ^b	0.25E-29 ^M	
Fe I	17714.37	6.58	-0.64 ^a	0.75E-29	
Fe I	17717.16	6.34	-0.75 ^a	0.15E-29	
Fe I	17721.09	6.58	0.45 ^a	0.49E-29 ^M	
Fe I	17721.35	6.58	0.22 ^a	0.75E-29	
Fe I	17722.20	5.88	-1.65 ^b	0.57E-30	
Fe I	17722.99	6.34	-1.32 ^b	0.15E-29	
Fe I	17723.17	6.34	-1.50 ^b	0.15E-29	
Fe I	17727.18	6.58	-0.69 ^a	0.75E-29	
Fe I	17727.40	5.75	-1.40 ^a	0.19E-29 ^E	
Fe I	17728.13	6.58	0.34 ^a	0.75E-29	
Mn I	17743.58	4.43	-1.37 ^a	0.39E-30	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Mn I	17743.82	4.43	-2.29 ^a	0.39E-30	
Mn I	17744.03	4.43	-3.51 ^a	0.39E-30	
Mn I	17744.25	4.43	-1.51 ^a	0.39E-30	
Mn I	17744.45	4.43	-2.11 ^a	0.39E-30	
Mn I	17744.62	4.43	-3.15 ^a	0.39E-30	
Mn I	17744.79	4.43	-1.67 ^a	0.39E-30	
Mn I	17744.96	4.43	-2.09 ^a	0.39E-30	
Mn I	17745.08	4.43	-3.03 ^a	0.39E-30	
Mn I	17745.21	4.43	-1.85 ^a	0.39E-30	
Mn I	17745.33	4.43	-2.15 ^a	0.39E-30	
Mn I	17745.41	4.43	-3.11 ^a	0.39E-30	
Mn I	17745.50	4.43	-2.07 ^a	0.39E-30	
Mn I	17745.58	4.43	-2.33 ^a	0.39E-30	
Mn I	17745.67	4.43	-2.36 ^a	0.39E-30	
Fe I	17746.23	5.72	-1.93 ^a	0.20E-29 ^E	
Fe I	17747.35	5.92	-0.76 ^a	0.10E-29 ^E	
Mg I	17749.62	6.73	-1.75 ^b	0.54E-28 ^M	
Ni I	17751.58	5.59	-1.38 ^b	0.54E-30	⁶⁰ Ni
Ni I	17751.79	5.59	-0.96 ^b	0.54E-30	⁵⁸ Ni
C I	17752.20	9.83	-1.80 ^c	0.44E-29 ^M	
Mg I	17753.70	6.73	-1.78 ^c	0.54E-28 ^M	
Mg I	17753.75	6.73	-1.47 ^c	0.54E-28 ^M	
Fe I	17755.17	6.34	-1.17 ^c	0.15E-29	
Mg I	17762.06	6.73	-1.11 ^b	0.54E-28 ^M	
Mg I	17762.06	6.73	-1.85 ^b	0.54E-28 ^M	
C I	17768.97	9.71	0.18 ^a	0.15E-29	
Fe I	17771.13	5.95	-0.07 ^a	0.11E-29 ^E	
Fe I	17774.27	5.97	-2.07 ^c	0.71E-30	
Fe I	17774.80	5.96	-1.54 ^c	0.11E-29 ^E	
C I	17776.91	7.95	-2.79 ^a	0.90E-31	
C I	17781.30	9.99	-1.14 ^c	0.61E-29 ^M	
C I	17786.17	7.95	-2.90 ^d	0.90E-31	
Fe I	17786.70	6.70	-0.77 ^c	0.10E-28 ^E	
C I	17789.69	7.95	-2.35 ^a	0.90E-31	
C I	17793.25	9.71	-0.26 ^a	0.15E-29	
Fe I	17797.84	6.34	-1.22 ^b	0.15E-29	
Ni I	17799.05	5.41	-2.44 ^b	0.32E-30	⁶² Ni
Ni I	17799.25	5.41	-1.56 ^b	0.32E-30	⁶⁰ Ni
Ni I	17799.47	5.41	-1.14 ^b	0.32E-30	⁵⁸ Ni
Fe I	17801.94	5.94	-1.92 ^b	0.67E-30	
Fe I	17803.59	6.41	-0.94 ^a	0.30E-29 ^E	
Fe I	17810.56	6.32	-1.79 ^c	0.28E-29 ^M	
Fe I	17810.98	6.45	-0.37 ^a	0.29E-29	
C I	17813.66	9.71	-0.66 ^a	0.15E-29	
C I	17813.96	9.71	0.10 ^a	0.15E-29	
Fe I	17822.47	6.28	-0.61 ^a	0.26E-29 ^M	
C I	17826.32	9.71	0.27 ^a	0.15E-29	
C I	17826.92	9.71	-0.79 ^b	0.15E-29	
Fe I	17835.72	6.70	0.00 ^b	0.10E-28 ^E	
Fe I	17836.09	6.70	0.53 ^a	0.10E-28 ^E	
Fe I	17836.52	6.70	0.07 ^b	0.10E-28 ^E	
C I	17837.03	9.00	-1.92 ^c	0.30E-30	
Fe I	17839.83	6.41	-1.12 ^b	0.31E-29 ^M	
Fe I	17845.11	6.43	-0.57 ^d	0.25E-29	
Fe I	17845.97	5.92	-0.25 ^d	0.10E-29 ^E	
Fe I	17845.97	6.43	-1.10 ^d	0.25E-29	
C I	17847.75	9.71	-1.06 ^b	0.15E-29	
C I	17853.46	7.95	-2.38 ^b	0.89E-31	
C I	17856.97	7.95	-2.85 ^b	0.89E-31	
Fe I	17861.71	6.59	-0.50 ^a	0.63E-29 ^M	
Fe I	17876.03	6.45	-0.77 ^a	0.30E-29	
Fe I	17880.88	6.45	-0.88 ^b	0.40E-29 ^M	
Ni I	17893.87	6.10	-0.27 ^a	0.30E-29	
Fe I	17904.65	6.35	-0.85 ^d	0.15E-29	
Fe I	17907.61	6.44	-1.43 ^c	0.38E-29 ^M	
C I	17918.37	9.33	-0.75 ^b	0.53E-30 ^E	
Fe I	17919.41	6.39	-0.95 ^d	0.19E-29	
Fe I	17923.96	6.61	-0.68 ^a	0.54E-29 ^M	
Fe I	17926.36	6.74	0.27 ^a	0.10E-28 ^E	
Fe I	17932.66	6.45	-0.22 ^a	0.30E-29	
Fe I	17937.84	5.92	-0.44 ^d	0.10E-29 ^E	
Cr I	17937.84	3.70	-3.39 ^f	0.60E-31	
Fe I	17938.32	6.74	0.05 ^c	0.10E-29 ^A	
Ni I	17942.00	6.28	-0.22 ^c	0.53E-29	
Fe I	17943.14	6.74	0.11 ^a	0.10E-29 ^A	
Fe I	17946.23	6.35	-1.52 ^b	0.15E-29	
Ni I	17949.33	6.09	-0.74 ^b	0.15E-29	
Ni I	17951.87	6.09	0.14 ^a	0.15E-29	
Fe I	17955.06	6.74	-1.21 ^c	0.10E-29 ^A	
Ni I	17956.85	6.10	-0.33 ^c	0.15E-29	
C I	17959.25	8.64	-1.68 ^b	0.27E-30	
C I	17966.20	8.64	-1.84 ^c	0.27E-30	

TABLE 3—*Continued*

Ion	λ	χ_{exc}	$\log gf$	C_6	note
Fe I	17966.42	6.35	-1.16 ^b	0.30E-29 ^M	
Fe I	17966.42	6.40	-1.16 ^b	0.34E-29 ^M	
Fe I	17968.10	6.59	-0.52 ^a	0.76E-29	
Fe I	17968.96	6.45	-0.98 ^b	0.29E-29	
Fe I	17970.91	5.90	-1.52 ^b	0.60E-30	
Fe I	17971.99	6.59	-0.32 ^a	0.76E-29	
Fe I	17982.32	6.59	0.25 ^a	0.76E-29	
Fe I	17985.74	6.59	-0.35 ^a	0.76E-29	
Ni I	17986.53	6.09	0.75 ^a	0.15E-29	
Ni I	17988.48	6.10	0.01 ^a	0.15E-29	